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ABSTRACT

This task-based curriculum guide is intended to help secondary teachers provide relevant training for an entry-level job in machine trades. Introductory materials include background information on trade and industrial education and program goals and safety information. Descriptions follow of the construction trades program, vocational cooperative education, work experience/unpaid work experience, work experience and career exploration programs, and vocational work study. This job information is then provided: job titles and a task inventory for machine trades. Tasks are grouped under 20 duties in the following categories: performing shop practices; performing tool crib and measurement/layout/inspection operations; applying metallurgical processes; interpreting blueprints; performing bench work; operating power saws, drill presses, lathes, milling machines, shapers, and pedestal as well as surface, cylindrical, and tool/cutter grinding machines; operating numerical control and electrodischarge machines; maintaining machines; and using employability skills. Duty tabs comprise the largest portion of the curriculum guide. Each task in the listing is presented in a one-page format that provides this information: duty, task, achievement indicators, criteria, tools and equipment, and resources. Other components of the curriculum guide include tool and equipment lists, a student achievement record, a class achievement record, a glossary of vocational terms, and resource and reference lists. (YLB)

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MICHIGAN TRADE & INDUSTRIAL EDUCATION
CURRICULUM GUIDE

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INTRODUCTION

The Michigan Department of Education, Vocational-Technical Education Service, has adopted descriptions and codes for vocational-technical education programs found in the document entitled, "A Classification of Instructional Programs" (C.I.P.) National Center for Educational Statistics, February, 1981. This new coding system is required of all states in reporting data on all programs receiving funds under P.L. 94-482, the Vocational Education Amendments of 1976.

The current United States Office of Education (U.S.O.E.) coding system was discontinued at the conclusion of the 1981-82 school year. The 1982-83 school year is a transition year from the U.S.O.E. code system to the new C.I.P. Code system.

This Michigan Trade and Industrial Education Curriculum Guide uses the new C.I.P. program description code(s) and lists the entry level job titles associated with the occupational program area by the Dictionary of Occupational Titles (Fourth Edition, 1977), D.O.T. Code, and the Michigan Occupational Information System, (M.O.I.S.), Numerical Index code. NOTE: This information is located under Job Information with program description(s).

PROGRAM DEFINITIONS/GOALS

Vocational Education

The term "vocational education" means organized educational programs which are directly related to the preparation for paid or unpaid employment or for additional preparation for a career requiring other than a baccalaureate or advanced degree.[1]

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[1] The Education Amendments of 1976, Section 195(1), Public Law 94-482.

Goals of Vocational-Technical Education

(1) To provide persons with differing sex, age, racial/ethnic backgrounds, social-economic status, academic disadvantage, economic disadvantage, limited English speaking ability, physical and mental capabilities, and geographical location access to vocational-technical education training or retraining.

(2) To coordinate pre-vocational exploration, career guidance, and placement programs so that each student may make informed and realistic occupational choices and have access to quality placement programs.

(3) To provide all students with learning experiences which are realistic and sufficient in light of their occupational objective.

(4) To insure that all vocational-technical programs will be planned, monitored, and evaluated in light of actual or anticipated employment opportunities and the demand by students for programs related to their abilities and occupational objectives.

Trade and Industrial Education

A vocational education curriculum that includes programs for manufacturing, construction, mechanical service, public service, health service, technical, and fisheries occupations, that prepares a person for entry level employment, upgrading or retraining in a semiskilled or skilled trade, semiprofessional or technical occupation, not generally classified as Agriculture, Distributive, Business or Office, in the Health profession, or Consumer/Home Economics in nature.

NOTE: The occupational clusters found within the scope of trade and industrial education include skilled or semiskilled trade, craft, or occupations which directly relate to the designing, producing, processing, assembling, maintaining, servicing, or repairing of any manufactured product.

TRADE AND INDUSTRIAL EDUCATION STUDENT ORGANIZATION

VICA

The Vocational Industrial Clubs of America (VICA) is the national organization serving trade, industrial, technical, and health occupations students in the United States. VICA incorporates leadership, citizenship, and character development programs and activities into the skill training offered in America's schools and taught by men and women who have worked in the occupational areas in which they now instruct their students.

VICA emphasizes respect for the dignity of work, high standards in trade ethics, workmanship, scholarship, and safety. VICA promotes understanding of the free enterprise system and encourages development of patriotism through the practice of democracy within the club.

Competitive activities in the trade skills as well as areas such as public speaking, job interview, parliamentary procedure and safety are vital aspects of VICA's program.

TRADE AND INDUSTRIAL EDUCATION CURRICULUM GUIDE

This Michigan Trade and Industrial Education Curriculum Guide is the result of a project funded by the Michigan State Board of Education and the Michigan Department of Education, Vocational-Technical Education Service. The project is located at Michigan State University in the College of Agriculture and Natural Resources' Education Institute (ANREI) and is known as the Curriculum Resource Team.

The project is directed by Dr. Chris M. Olson and Ms. Carol E. Culpepper, Faculty Specialist, Curriculum Resource Team Coordinators. They were responsible for developing the curriculum format and working with a task force leader and committee of individuals from business, industry, and education to ensure the quality of the curriculum. The development of this curriculum was monitored by Melvin France, Secondary Trade and Industrial Education Supervisor.

The names of the occupational task force leader(s) committee members, secretaries, and other support staff are acknowledged after this Introduction.

The occupational program area(s) selected for curriculum development are based on a Vocational-Technical Education Service prioritized program ranking based on employment demand, State average percent of placement, reimbursed enrollments, the number of programs, and entry level wages within the State of Michigan.

This curriculum guide was developed from the results of a statewide survey and job analysis of incumbent workers in the related occupational areas.

The curriculum guide is representative of the occupational job duty categories which list major activities and tasks performed on an entry level job. The curriculum guide contains a resource list and criteria statements which indicate the minimum standards of performance accepted as evidence of competence in completion of the task by business and industry. This is a task-based curriculum guide which helps a teacher develop a classroom management system where students learn by doing. It is based on task analysis and reflects the skills, knowledge, and attitudes that employers expect incumbent workers to possess.

The curriculum is linked to the labor market, helps the instructor open communication channels with business and industry, and manage classroom instruction where students learn "Need-to-Know" instead of "Nice-to-Know" facts.

This curriculum is adaptable for special needs/handicapped students, helps to validate the program, prepares students for entry level jobs and helps students to make career choices related to job placement.

It is the intent by all those involved in the development of this curriculum guide that it be used to provide relevant training or retraining for employment in the world of work.

The secondary occupational programs/courses in Michigan should meet the following minimum standards to assure soundness and quality of instruction:

(1) The program of instruction must be based on a consideration of the skills and knowledge required in the occupation for which the

instruction is being provided, and includes a planned logical sequence for those essentials of education or experience deemed necessary for the individual to meet an occupational objective.

(2) The program of instruction must be developed and conducted in consultation with a Local Advisory Council/Committee which has an appropriate representation of both sexes and an appropriate representation of racial and ethnic minorities found in the program area, school, and community origin. The local advisory council will advise on current job needs, relevance of programs, and courses in meeting current job needs and consult with the local educational agency in developing program application.

(3) The program of instruction will include the most up-to-date curriculum based on the competencies required in the occupation or occupational field in which the individual is being prepared, upgraded, or updated.

(4) The program of instruction will be sufficiently extensive in duration and intensive within a schedule unit of time to enable the student to develop the necessary knowledge, attitudes, and skills necessary for employment in the occupation or occupational field.

(5) The program of instruction will combine and coordinate related instruction with field, shop, laboratory, cooperative work, or other occupational experience which is appropriate to the vocational objective of the student, is of sufficient duration to develop competencies necessary for employment in the occupation or occupational field, and supervised, directed, or coordinated by a person qualified under the State Plan.

Facilities, equipment, and instructional materials:

(1) Classrooms, libraries, shops, laboratories, and other facilities, including instructional equipment, supplies, teaching aids, and other materials will be adequate in supply and quality to meet the standards approved by the State Board so that such facilities are adequate to enable those who are to be trained to meet the occupational objective for which the education is intended.

(2) If the State Board or local educational agency cannot provide adequate facilities and materials, and such are available in a business or industrial establishment, funds may be used to reimburse the local public educational agency for training programs conducted in private industry when it complies with the training standards and regulations established by the State Board. Such instruction shall be under the supervision and administration of a local public educational agency.

ACKNOWLEDGEMENT

The Michigan Trade and Industrial Curriculum Guide(s) were developed through a series of workshops held throughout the State and at Michigan State University during the 1982-83 school year.

Appreciation is given to all who have contributed their thoughts, time and energy to this curriculum project.

The Michigan Department of Education, Vocational-Technical Education Service, is indebted to the following individuals who were instrumental in the completion of this project and the development of the materials:

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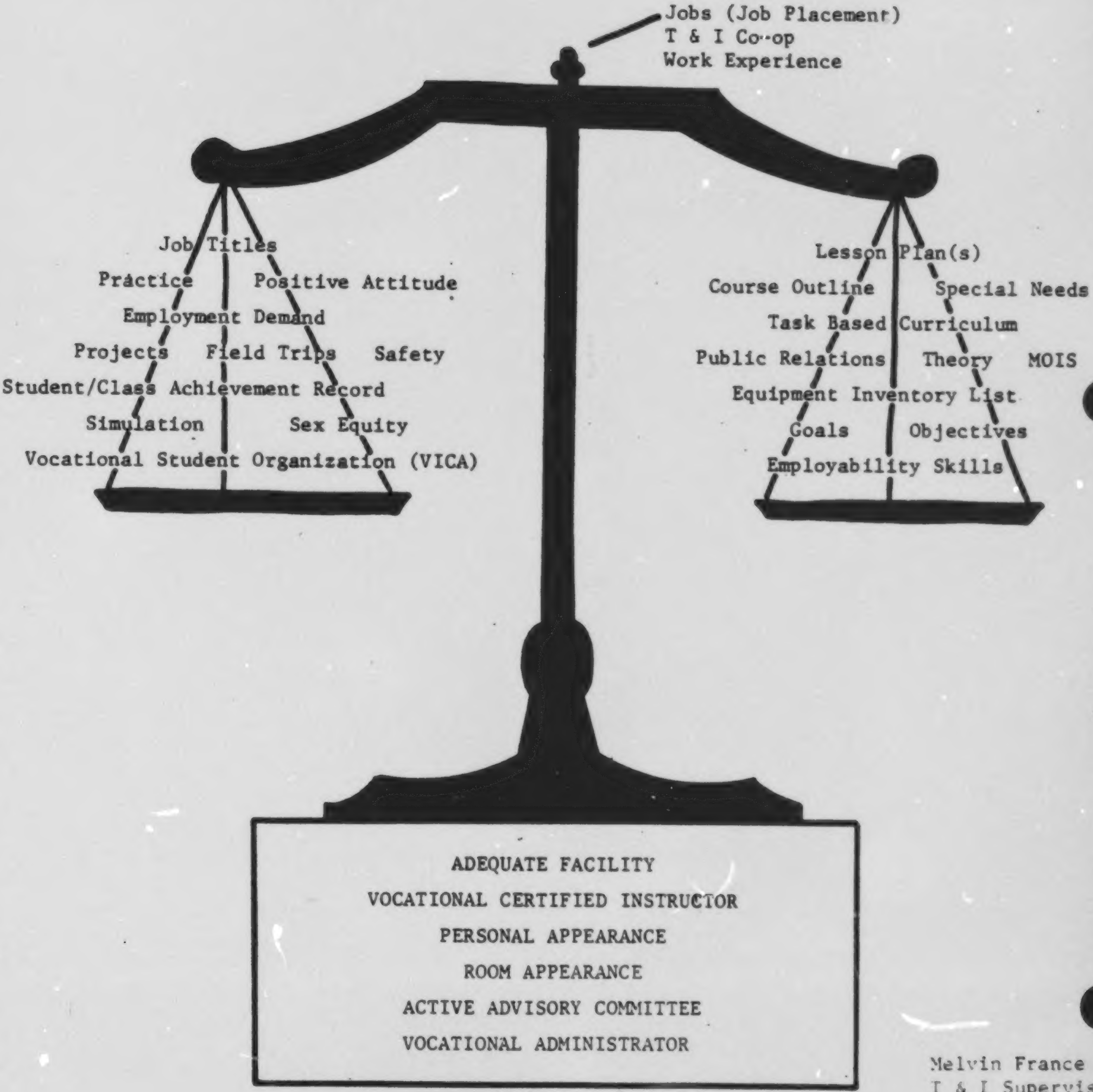
MICHIGAN TRADE AND INDUSTRIAL EDUCATION

IS YOURS A BALANCED PROGRAM?



Jobs (Job Placement)
T & I Co-op
Work Experience

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Practice
Positive Attitude
Employment Demand
Projects
Field Trips
Safety
Student/Class Achievement Record
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ADEQUATE FACILITY
VOCATIONAL CERTIFIED INSTRUCTOR
PERSONAL APPEARANCE
ROOM APPEARANCE
ACTIVE ADVISORY COMMITTEE
VOCATIONAL ADMINISTRATOR

Melvin France
T & I Superviso
Secondary Unit

DEPARTMENT OF EDUCATION

STATE BOARD OF EDUCATION

EYE PROTECTIVE DEVICES

Filed with Secretary of State,

These rules take effect 15 days after filing with the Secretary of State

(By authority conferred on the state board of education by section 585a of Act No. 269 of the Public Acts of 1955, as added, being section 340.585a of the Compiled Laws of 1948.)

R 340.1301. Definitions.

Rule 1. As used in these rules:

(a) "Caustic" or "acid" means a material, exclusive of hot water or steam, capable of destroying, eroding or burning of flesh by chemical action.

(b) "Explosive material" means a substance capable of a large-scale, rapid and spectacular expansion which will propel materials in a manner causing injury to the human body.

(c) "Hot liquid" or "solid" means a material having effects that are physically harmful to the eyes.

(d) "Sanitizing" means the disinfecting and cleaning of eye protective devices before use.

(e) "When exposure to eye danger exists" means the exposure when a person is within that distance from sparks, flying particles, rays, molten metal, fumes, glare, glass breakage or chemical splash that such an object or condition could cause damage to his eyes, if he was not using a protective device.

R 340.1302. Educational courses requiring eye protection.

Rule 2. A public educational agency which enrolls students in the following courses when exposure to eye danger exists, shall furnish eye protective devices: vocational or industrial arts shops or laboratories involving the use of or working with hot molten metals, milling, sawing, turning, shaping, grinding, cutting or stamping of any solid materials; heat treatment, tempering or kiln firing of any metal or other materials; gas or electric arc welding; repair or servicing of any vehicles; caustic or explosive materials; or chemical or combined chemical-physical laboratory work involving acid, caustic or explosive chemicals or hot liquids or solids.

R 340.1303. Standards for devices.

Rule 3. (1) An eye protective device shall meet the following standards based upon the operation involved:

(a) Acetylene burning, acetylene cutting, and acetylene welding operations - welding goggles of eyecup type with tinted lenses or welding goggles of coverspec type with tinted lenses or welding goggles of coverspec type with tinted plate lenses. This protects against the primary hazards of sparks, harmful rays, molten metal and flying particles.

(b) Chemical handling operations - goggles of flexible fitting with hooded ventilation or face shield with plastic or mesh window. This protects against the primary hazards of splash, acid burns and fumes.

(c) Chipping operations - goggles of flexible fitting with regular ventilation or goggles of cushioned fitting with rigid body or spectacles of metal frame with sideshields or spectacles of plastic frame with sideshields or spectacles of metal-plastic frame with sideshields or chipping goggles of eyecup type with clear safety lenses or chipping goggles of coverspec type with clear safety lenses. This protects against the primary hazard of flying particles.

(d) Electric (arc) welding operations - welding goggles of coverspec type with tinted plate lenses or welding helmets or welding helmet in combination with tinted lens spectacles. This protects against the primary hazards of sparks, intense rays and molten metal.

(e) Furnace operations - welding goggles of eyecup type with tinted lenses or welding goggles of coverspec type with tinted lenses or welding goggles of coverspec type with tinted plate lenses. This protects against the primary hazards of glare, heat and molten metal.

(f) Light grinding, machining, and spot welding operations - goggles of flexible fitting with regular ventilation or goggles of cushioned fitting with rigid body or spectacles of metal frame with sideshields or spectacles of plastic frame with sideshields or spectacles of metal-plastic frame with sideshields or face shield with plastic or mesh window. This protects against the primary hazards of flying particles and sparks.

(g) Heavy grinding operations - goggles of flexible fitting with regular ventilation or goggles of cushioned fitting with rigid body or chipping goggles of eyecup type with clear safety lenses or chipping goggles of coverspec type with clear safety lenses or in case of severe exposure add face shield with plastic or mesh window. This protects against the primary hazard of flying particles.

(h) Laboratory operations - goggles of flexible fitting with hooded ventilation or face shield in combination with metal or plastic frame spectacles with sideshields. This protects against the primary hazards of chemical splash and glass breakage.

(i) Molten metal operations - welding goggles of eyecup type with tinted lenses or welding goggles of coverspec type with tinted lenses or face shield in combination with metal or plastic frame spectacles with sideshields and tinted lenses. This protects against the primary hazards of heat, glare, sparks and splash.

(2) The standards described in subrule (1) are taken from the American National Standards Safety Code Z87.1-1968, figure 8, page 28, which is available from the American National Standards Institute, Incorporated, 1430 Broadway, New York, New York 10018, at a cost of $5.00. Applicable excerpts from the American National Standards Safety Code are available at no cost from the Michigan department of education, Lansing, Michigan.

R 340.1304. Sanitization of devices.

Rule 4. An eye protective device shall be sanitized when 2 or more students use the same device, by either:

(a) Washing after each use in warm water and soap or detergent, followed by a rinse in running water.

(b) Placing in a cabinet with ultraviolet light and washing once a week as in subdivision (a).

R 340.1305. Compliance.

Rule 5. (1) A superintendent of a school district shall certify to the intermediate school district superintendent not later than the second week of each school year, on forms prescribed by the Michigan department of education, that eye protective devices meeting the standards of these rules have been obtained. For the school year 1972-73, certification shall be made within 4 weeks after the effective date of these rules. This certification shall also indicate that instructors have been informed that all students, teachers and visitors shall wear the devices when exposure to eye damage exists, as identified in these rules.

(2) An intermediate school district superintendent shall report to the state superintendent of public instruction by October 1 the names of those constituent school districts which are not in compliance with these rules. For the school year 1972-73, the report shall be made within 6 weeks after the effective date of these rules.

(3) The state superintendent of public instruction shall notify a school district in violation of these rules that it shall comply or show cause why compliance cannot be made within 30 days.

ACT NO. 54 OF THE PUBLIC ACTS OF 1972

ENROLLED SENATE BILL NO. 553

AN ACT to amend Act No. 269 of the Public Acts of 1955, entitled "The Michigan School Code", and to repeal certain acts and parts of acts, as amended, being sections 340.1 to 340.984 of the Compiled Laws of 1948, by adding section 585a.

The People of the State of Michigan enact:

Section 1.. Act No. 269 of the Public Acts of 1955, as amended, being sections 340.1 to 340.984 of the Compiled Laws of 1948, is amended by adding section 585a to read as follows:

Sec. 585a. (1) Every pupil and teacher participating in a course mentioned in this section shall wear industrial quality eye protective devices, which have been sanitized prior to use, when exposure to danger exists while participating in such course. The board of education shall furnish the devices for pupils, teachers and visitors to the classrooms or laboratories. The courses for which protective devices are required are:

(a) Vocational or industrial arts shops or laboratories involving the use of or working with hot molten metals, milling, sawing, turning, shaping, grinding, cutting or stamping of any solid materials; heat treatment, tempering or kiln firing of any metal or other materials; gas or electric arc welding; repair or servicing of any vehicle; or caustic or explosive materials.

(b) Chemical or combined chemical-physical laboratory work involving acid, caustic or explosive chemicals or hot liquids or solids.

(2) "Industrial quality eye protective devices" means devices meeting the standards of the american standard safety code for head, eye and respiratory protection, Z87.1-1968, promulgated by the american standards association, incorporated.

(3) The provisions of this section shall be enforced pursuant to rules promulgated by the state board of education in accordance with and subject to Act No. 306 of the Public Acts of 1969, as amended, being sections 24.201 to 24.315 of the Compiled Laws of 1948.

Section 2. This amendatory act shall take effect September 1, 1972.

The following adapted from the:

NATIONAL STANDARD SCHOOL SHOP SAFETY INSPECTION CHECK LIST

Prepared by the Joint Safety Committee of the
AMERICAN VOCATIONAL ASSOCIATION — NATIONAL SAFETY COUNCIL

______________________________ Date ______________

____

INTRODUCTION

A safe environment is an essential part of the school shop safety education program. The safe environment will exist only if hazards are discovered and corrected through *regular* and *frequent* inspections by school personnel—administrators, teachers and students. Safety inspections are to determine if everything is satisfactory.

Inspections may be made at the request of the board of education, the school administration or upon the initiative of the teacher. Some communities have drawn upon the cooperative service of professional safety engineers, inspectors of state labor departments, insurance companies and local safety councils to supplement and confirm inspections by school personnel.

The National Standard School Shop Safety Inspection Check List, recommended by the President's Conference on Industrial Safety is an objective inspection procedure for the school shop.

DIRECTIONS

WHO INSPECTS?

This will depend upon local policies. It is recommended, however, that shop teachers, and students—the student safety engineer and/or student safety committee—participate in making regular inspections. This not only tends to share responsibility but stimulates a broader interest in the maintenance of a safe school shop.

WHEN TO INSPECT?

As a minimum, a safety inspection should be made at the beginning of every school term or semester. More frequent inspections may be advisable.

HOW TO INSPECT?

Inspections should be well planned in advance.

Inspections should be systematic and thorough. No location that may contain a hazard should be overlooked.

Inspection reports should be clear and concise, but with sufficient explanation to make each recommendation for improvement understandable.

FOLLOW-UP

The current report should be compared with previous records to determine progress. The report should be studied in terms of the accident situation so that special attention can be given to those conditions and locations which are accident producers.

Each unsafe condition should be corrected as soon as possible in accordance with accepted local procedures.

A definite policy should be established in regard to taking materials and equipment out of service because of unsafe conditions.

The inspection report can be used to advantage as the subject for staff and class discussion.

CHECKING PROCEDURE

Draw a circle around the appropriate letter, using the following letter scheme:

S — Satisfactory (needs no attention)
A — Acceptable (needs some attention)
U — Unsatisfactory (needs immediate attention)

Recommendations should be made in all cases where a "U" is circled. Space is provided at the end of the form for such comments. Designate the items covered by the recommendations, using the code number applicable (as B-2).

In most categories, space is provided for listing of standards, requirements or regulations which have local application only.

A. GENERAL PHYSICAL CONDITION

1. Machines, benches, and other equipment are arranged so as to conform to good safety practices .... S A U
2. Condition of stairways .... S A U
3. Condition of aisles .... S A U
4. Condition of floors .... S A U
5. Condition of walls, windows, and ceiling .... S A U
6. Illumination is safe, sufficient, and well placed .... S A U
7. Ventilation is adequate and proper for conditions .... S A U
8. Temperature control .... S A U
9. Fire extinguishers are of proper type, adequately supplied, properly located and maintained .... S A U
10. Teacher and pupils know location of and how to use proper type for various fires .... S A U
11. Number and location of exits is adequate and properly identified .... S A U
12. Proper procedures have been formulated for emptying the room of pupils and taking adequate precautions in case of emergencies S A U
13. Lockers are inspected regularly for cleanliness and fire hazards. S A U
14. Locker doors are kept closed .... S A U
15. Walls are clear of objects that might fall .... S A U
16. Utility lines are properly identified .... S A U
17. Teachers know the procedure in the event of fire including notification of the fire department and the evacuation of the building. S A U
18. Air in shop is free from excessive dust, smoke, etc. .... S A U
19. ______________________ S A U
20. ______________________ S A U
21. ______________________ S A U
22. ______________________ S A U
23. Evaluation for the total rating of A. GENERAL PHYSICAL CONDITION .... S A U

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B. HOUSEKEEPING

1. General appearance as to orderliness .... S A U

2. Adequate and proper storage space for tools and materials. S A U

3. Benches are kept orderly .... S A U

4. Corners are clean and clear .... S A U

5. Special tool racks, in orderly condition, and provided at benches and machines .... S A U

6. Tool, supply, and/or material room is orderly .... S A U

7. Sufficient scrap boxes are provided .... S A U

8. Scrap stock is put in scrap boxes promptly .... S A U

9. Materials are stored in an orderly and safe condition .. S A U

10. A spring lid metal container is provided for waste and oily rags. S A U

11. All waste materials and oily rags are promptly placed in the containers .... S A U

12. Containers for oily rags and waste materials are frequently and regularly emptied .... S A U

13. Dangerous materials are stored in metal cabinets ..... S A U

14. Machines have been color conditioned .... S A U

15. Safety cans are provided for flammable liquids .... S A U

16. Bulk storage of dangerous materials is provided outside of the main building .... S A U

17. A toe-board or railing around a mezzanine used for storage or washing facilities .... S A U

18. Materials are stored in an orderly and safe condition on this mezzanine .... S A U

19. Flammable liquids are not used for cleaning purposes S A U

20. Floors are free of oil, water and foreign material ..... S A U

21. Floors, walls, windows, and ceilings are cleaned periodically. S A U

22. ______________________________ S A U

23. ______________________________ S A U

24. ______________________________ S A U

25. ______________________________ S A U

26. Evaluation for the total rating for B. HOUSEKEEPING S A U

C. EQUIPMENT

1. Machines are arranged so that workers are protected from hazards of other machines, passing students, etc. .... S A U

2. Danger zones are properly indicated and guarded ...... S A U

3. All gears, moving belts, etc., are protected by permanent enclosure guards .... S A U

4. All guards are used as much as possible .... S A U

C. EQUIPMENT (continued)

5. All equipment control switches are easily available to operator S A

6. All machines are "locked off" when instructor is out of the ro S A

7. Brushes are used for cleaning equipment .... S A

8. Nonskid areas are provided around machines .... S A

9. Machines are in safe working condition .... S A

10. Machines are guarded to comply with American Standards Association and local state code .... S A

11. Adequate supervision is maintained when students are using machines and dangerous tools .... S A

12. Tools are kept sharp, clean and in safe working order S A

13. All hoisting devices are in safe operating condition ... S A

14. Machines are shut off while unattended .... S A

15. Adequate storage facilities for tools, equipment, etc., not in immediate use .... S A

16. ______________________________ S A

17. ______________________________ S A

18. ______________________________ S A

19. ______________________________ S A

20. Evaluation for the total rating for C. EQUIPMENT .. S A

D. ELECTRICAL INSTALLATION

1. All switches are enclosed .... S A

2. There is a master control switch for all of the electrical installations .... S A

3. Electrical outlets and circuits are properly identified .. S A

4. All electrical extension cords are in safe condition and are no carrying excessive loads .... S A

5. All machine switches are within easy reach of the operators. S A

6. Electrical motors and equipment are wired to comply with th National Electric Code .... S A

7. Individual cut-off switches are provided for each machine. S A

8. Machines are provided with overload and underload controls b magnetic pushbutton controls .... S A

9. No temporary wiring in evidence .... S A

10. ______________________________ S A

11. ______________________________ S A

12. ______________________________ S A

13. ______________________________ S A

14. Evaluation for the total rating for D. ELECTRICAL INSTALLATION .... S A

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E. GAS

1. Gas flow to appliances is regulated, so that when appliance valve is turned on full, the flames are not too high............ S A U

2. Gas appliances are properly insulated with asbestos or other insulating material from tables, benches, adjacent walls, or other flammable materials .... S A U

3. No gas hose is used where pipe connections could be made. S A U

4. Gas appliances have been adjusted so that they may be lighted without undue hazard.................................... S A U

5. Students have been instructed when lighting gas appliances to light the match first before turning on the gas............ S A U

6. There are no gas leaks, nor is any odor of gas detectable in any part of the shop.. S A U

7. Shop instruction has been given concerning the lighting of gas furnaces operating with both air and gas under pressure.. S A U

8. When lighting the gas forge, goggles are worn....... S A U

9. When lighting the gas furnace, the following procedure is used: (a) light the match; (b) turn on the gas; (c) drop the match in the hole in top of the furnace................................ S A U

10. In shutting down the gas furnace, the gas valve is closed before the air valve.. S A U

11. ______________________________ S A U

12. ______________________________ S A U

13. ______________________________ S A U

14. ______________________________ S A U

5. Evaluation for the total rating for E. GAS.......... S A U

F. PERSONAL PROTECTION

1. Goggles or protective shields are provided and required for all work where eye hazards exist......................... S A U

2. If individual goggles are not provided, hoods and goggles are properly disinfected before use......................... S A U

3. Shields and goggles are provided for electric welding.. S A U

4. Rings and other jewelry are removed by pupils when working in the shop.. S A U

5. Proper kind of wearing apparel is worn and worn properly for the job being done.. S A U

6. Leggings, safety shoes, etc., are worn in special classes such as foundry, etc., when needed............................ S A U

7. Respirators are provided for dusty or toxic atmospheric conditions such as when spraying in the finishing room......... S A U

8. Provisions are made for cleaning and sterilizing respirators. S A U

9. Students are examined for safety knowledge ability.. S A U

10. Sleeves are rolled above elbows when operating machines. S A U

11. Clothing of students is free from loose sleeves, flopping ties, loose coats, etc. .... S A U

12. ____ S A U

F. PERSONAL PROTECTION (continued)

13. ______________________________ S A U

14. ______________________________ S A U

15. ______________________________ S A U

16. Evaluation for the total rating for F. PERSONAL PROTECTION. S A U

G. INSTRUCTION

1. Shop Safety is taught as an integral part of each teaching unit. S A U

2. Safety rules are posted particularly at each danger station. S A U

3. Printed safety rules are given each student.......... S A U

4. Pupils take a safety pledge....................... S A U

5. Use of a safety inspector.......................... S A U

6. Use of a student shop safety committee.......... S A U

7. Use of safety contests...... .... S A U

8. Motion and/or slide films on safety are used in the instruction. S A U

9. Use of suggestion box............................. S A U

10. Use of safety tests............................... S A U

11. Use of safety posters............................. S A U

12. Talks on safety are given to the classes by industrial men. S A U

13. Tours are taken of industrial plants as a means of studying safety practices .... S A U

14. Periodic safety inspections of the shop are made by a student committee .... S A U

15. Men from industry make safety inspections of the shop S A U

16. Student shop safety committee investigates all accidents S A U

17. A proper record is kept of safety instructions which are given, preferably showing the signature of student on tests given in this area .... S A U

18. Rotate students on the Shop Safety Committee so that as many students as possible have an opportunity to participate... S A U

19. ______________________________ S A U

20. ______________________________ S A U

21. ______________________________ S A U

22. ______________________________ S A U

23. Evaluation for the total rating of G. INSTRUCTION S A U

H. ACCIDENT RECORDS

1. There is a written statement outlining the proper procedure when and if a student is seriously hurt....................... S A U

2. Adequate accident statistics are kept................ S A U

3. Accidents are reported to the proper administrative authority by the instructor .... S A U

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H. ACCIDENT RECORD (continued)

4. A copy of each accident report is filed with the State Department of Education .... S A U
5. Accident reports are analyzed for instructional purposes and to furnish the basis for elimination of hazards.............. S A U
6. ______________________________ S A U
7. ______________________________ S A U
8. ______________________________ S A U
9. ______________________________ S A U
10. Evaluation for the total rating of H. ACCIDENT RECORDS. S A U

I. FIRST AID

1. An adequately stocked first aid cabinet is provided... S A
2. The first aid is administered by a qualified individual S A
3. The school has individuals qualified to administer first aid. S A
4. ______________________________ S A
5. ______________________________ S A
6. ______________________________ S A
7. ______________________________ S A
8. Evaluation for the total rating of I. FIRST AID.... S A

RECOMMENDATIONS

Code No.	

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C.I.P. PROGRAM DESCRIPTION

48.0503 Machine Trades - (Machine Tool Operation/Machine Shop)

An approved instructional program that prepares individuals to shape metal parts on machines such as lathes, grinders, drill presses, milling machines, and shapers. Programs may also train individuals in the use of one machine tool. Includes instruction in making computations related to work dimensions, testing feeds and speeds of machines using precision measuring instruments such as layout tools, micrometers, and gauges; machining and heat-treating various metals; and in the laying out machine parts.

VOCATIONAL COOPERATIVE EDUCATION

Definition

"The term 'cooperative education' means a program of vocational education for persons who, through written cooperative arrangements between the school and employers, receive instruction, including required academic courses and related vocational instruction by alternation of study in school with a job in any occupational field, but these two experiences must be planned and supervised by the school and employers so that each contributes to the student's education and to his or her employability. Work periods and school attendance may be on alternate half days, full days, weeks, or other periods of time in fulfilling the cooperative program." (P.L. 94-482)

Responsibilities of School District

The local school district must meet all the Federal requirements of P.L. 94-482, Section 122; 45 CFR 104.531 through 104.533 and the State of Michigan Statutes and General School Laws listed below:

A. IT IS A PROGRAM OF VOCATIONAL EDUCATION.

"Vocational program" means laboratory, simulation or instruction based upon individually designed learning experiences in a vocational subject preparing the student for competencies required in a recognized occupation coded in accordance with the most recent vocational education listing of programs by the United States Department of Education.

B. THERE IS A WRITTEN AGREEMENT BETWEEN THE SCHOOL AND EMPLOYERS.

The Youth Employment Standards Act (P.A. 90 of 1978) governs the legal employment of minors in Michigan. In section 18 of the Act, a provision is made to allow a written agreement, or contract, to be entered into between an employer and the board of education of the school district, in which the minor is enrolled. This written agreement exempts a student from obtaining a work permit and allows the student to be legally employed in Michigan. The employment, however, shall not be in violation of a Federal Statute or regulation and a signed copy of the agreement shall be on file in the place of employment before a minor begins employment. The training agreement, in cooperative education, is the legal written agreement developed cooperatively between the employer, teacher-coordinator, student, and parent and outlines the responsibilities of the employer and student to the program and establishes the legal conditions of the student-learner's employment.

C. THERE IS INSTRUCTION (INCLUDING REQUIRED ACADEMIC INSTRUCTION) IN SCHOOL RELATED TO THE JOB IN ANY OCCUPATIONAL AREA.

The program is of sufficient duration to develop competencies necessary to prepare the learner for employment. It provides a coordinated instructional program combining supervised part-time employment and classroom instruction related to the learner's job. Related vocational instruction for cooperative education enrollees shall be scheduled weekly.

D. THE ALTERNATION OF STUDY AND WORK ARE PLANNED AND SUPERVISED BY THE SCHOOL AND EMPLOYER IN ORDER TO FURTHER THE STUDENT'S EDUCATION AND EMPLOYABILITY.

The student-learner shall be employed for an average of not less than 15 hours per week during the effective time of the individual's program. The school shall have the responsibility of providing coordination and supervision services during such time.

E. STUDENTS ARE EMPLOYED AND COMPENSATED IN CONFORMITY WITH FEDERAL, STATE AND LOCAL LAWS.

The program provides cooperative on-the-job training that (1) employs and compensates student-learners in conformity with Federal, State, and local laws and regulations and in a manner not resulting in exploitation of the student-learner for private gain, and (2) is conducted in accordance with written training agreements between local education agencies and employers.

References

Individuals requiring additional information pertaining to cooperative education principles and practices are asked to consult the Michigan Department of Education, Vocational-Technical Education Service, developed Cooperative Education Handbook available in September of 1981.

WORK EXPERIENCE

PAID WORK EXPERIENCE

Definition

Paid work experience programs are school-sponsored and supervised employment programs. Students are allowed to earn academic credit while employed in the community. The employment serves as a means of acquiring desirable work habits and attitudes towards the world of work. The employment is not necessarily related to a student's career interest and enrollment in a related vocational education program is not required.

Objectives

Paid work experience programs are designed to provide students an opportunity to:

1. Foster positive attitudes about work, school and society
2. Promote an understanding in the dignity of work
3. Develop a student's ability to understand and function in an employer-employee relationship
4. Earn wages to remain in school
5. Experience an alternative to the traditional school program

Guidelines

1. Written work agreements should be completed between the employer, student, parent and school
2. Written work agreements should be completed in conformance to all Federal, State and local laws, rules and regulations; including non-discrimination against any student because of race, color, sex, national origin or ancestry. This policy of non-discrimination shall also apply to otherwise qualified handicapped individuals
3. Related academic instruction, where possible, should be provided
4. A school work experience coordinator should be provided to serve as a liaison between the student, employee, parents and school officials
5. Academic credit should be awarded for participation in the program

Funding

The Michigan Department of Education, the Vocational-Technical Education Service does not fund paid work experience programs.

UNPAID WORK EXPERIENCE

Definition

Unpaid work experience is a school sponsored and supervised instructional technique used in vocational education programs in which students are placed with an employer for a limited time and are not compensated during the duration of the experience.

Objectives

Unpaid work experience programs are designed to provide students with an opportunity to:

1. Receive on-site exposure to various businesses and industries while participating in a related vocational education program
2. Develop a realistic understanding of the relationship between education and the world of work
3. Enhance a positive self-image
4. Assist in the selection of occupational choices
5. Expand learning opportunities by using community resources

Guidelines

1. The training, even though it includes actual operation of the facilities of the participating employer is similar to that given in a vocational school
2. The training is for the benefit of the trainee
3. The trainee does not displace a regular employee, but does work under a regular employee's close observation
4. The participating employer does not derive an immediate advantage from the activities of the trainee
5. The trainee is not necessarily entitled to a job at the conclusion of the training period
6. The trainee is not entitled to wages for the time spent in the training
7. The training is for not more than 45 hours with a participating employer during each school semester
8. The training is conducted under a written work experience training agreement between the school district and the participating employer

Funding

The Michigan Department of Education, the Vocational-Technical Education Service does not fund unpaid work experience but considers it to be an allowable instructional activity under a given vocational education program.

WORK EXPERIENCE AND CAREER EXPLORATION PROGRAM
(W.E.C.E.P.)

I. Definition

The Work Experience and Career Exploration Program (W.E.C.E.P.) is a school-supervised and administered program that includes part-time work as an integral part of an educational program aimed at motivating 14 and 15 year-old youth toward education and preparing them for the world of work.

II. Program Objectives

There are several objectives of a W.E.C.E.P. program:

A. To provide a career-oriented educational program for dropout prone youth to become oriented and motivated toward education and the world of work.

B. To increase the desire to learn and improve educational performance.

C. To develop a greater degree of self-confidence, responsibility and aid in the maturation process of the student participants.

D. To provide student participants with on-the-job learning experiences that are in harmony with their interests, needs and objectives.

E. To improve school adjustment of student participants for whom the traditional curriculum is found to be inadequate.

F. To promote personal and social adjustment of the student participants and establish emotional stability through a feeling of being engaged in worthwhile activity.

III. Instructional Content

W.E.C.E.P. programs are planned so as to include part-time work supervised by employers and school personnel, as an integrated part of the enrollee's educational program. Students receive work experience on jobs permitted or approved under Federal or State laws. Students are in class with a W.E.C.E.P. teacher-coordinator for job-related and occupational safety, including needed individualized or remedial instruction. Students also receive a minimum of 20 hours of instruction on the Michigan Occupational Information System (MOIS) and a minimum of 30 hours of employability skills instruction. The students' employment is under the supervision of W.E.C.E.P. teacher-coordinators and employers. Students receive all State required courses necessary for graduation. The W.E.C.E.P. program is planned so that the students' individual academic achievement potential is recognized.

IV. Program Organization

The Vocational-Technical Education Service, Michigan Department of Education requires that W.E.C.E.P. programs in local districts meet the following criteria:

A. Eligibility. Any student aged 14 or 15 years, whom authoritative local school personnel identify as being able to benefit from the program, shall be eligible to participate.

B. Credits. Students shall receive school credits for both in-school related instruction and on-the-job experience.

C. Size. Each program unit shall consist of 12 to 25 students to one W.E.C.E.P. teacher-coordinator.

D. Instructional Schedule. W.E.C.E.P. students will spend a minimum of four periods daily in classroom instruction including one period of 180 hours of instruction devoted to job-related and employability skill instruction, safety and career exploration. Each student will have a minimum of 20 hours of career exploration utilizing the Michigan Occupational Information System (MOIS) and have a minimum of 30 hours of instruction in employability skills training. The employability skills training will equal or exceed the employability skills performance objectives adopted, as part of Michigan Vocational-Technical Service programs. Each local district submitting a letter of application to operate a W.E.C.E.P. program will furnish to the Vocational-Technical Education Service a course outline for the related class.

E. W.E.C.E.P. Teacher-Coordinator. Each program unit shall be under the supervision of a school official to be designated for the purpose of the program as a W.E.C.E.P. teacher-coordinator, who shall generally supervise the program and coordinate the work and education aspects of the program and make regularly scheduled visits to the work stations.

F. Written W.E.C.E.P. Training Agreement. No student shall participate in the program until there has been made a written E.E.C.E.P. training agreement signed by the W.E.C.E.P. teacher-coordinator, the employer and the student. The agreement shall also be signed or otherwise consented to by the student's parent or guardian. The W.E.C.E.P. training agreement will detail job tasks and related in-school instruction. A sample W.E.C.E.P. training agreement will be submitted annually by the local district to the Vocational-Technical Education Service.

G. Provision for Health and Well-Being. Employment under W.E.C.E.P. will not interfere with the schooling of the minors or with their health and well-being.

H. Records and Reports. The names and addresses of each school and the names and addresses of each employer enrolling work experience and career exploration program students and the number of enrollees in each unit shall be kept at the Vocational-Technical Education Service's office. A copy of the written W.E.C.E.P. training agreement for each student participating in the program shall be kept in the local educational office. The records required (for this paragraph) shall be kept for a period of three years from the date of enrollment in the program and shall be made available for inspection or transcription to the representatives of the Administrator of the Wage and Hour Division. Each school district operating a W.E.C.E.P. program shall submit an annual evaluative report by June 30th, which details the results of the W.E.C.E.P. program in terms of attendance and tardiness patterns, grade point average trends and dropout statistics of the enrollees. Based on a favorable state agency evaluation, a local district will be approved on an annual basis to operate a W.E.C.E.P. program. Under no circumstances can a local district operate a W.E.C.E.P. program without first obtaining written state agency approval for the program.

I. Approved Occupations. Employment of minors enrolled in a W.E.C.E.P. program approved pursuant to the requirements of this section shall be permitted in all occupations except the following:

1. Manufacturing and mining.

2. Occupations declared to be hazardous for the employment of minors between 16 and 18 years of age in Subpart E of Part 570 Child Labor Regulations, Orders and Statements of Interpretation of the Federal Fair Labor Standards Act, and occupations in agriculture declared to be hazardous for employment of minors below the age of 16 in Subpart E-1 of this part.

3. Occupations other than those permitted under sections 570.33 and 570.34 except upon approval of a variation in individual cases or classes of cases by the Administrator of the Wage and Hour Division after notice to interested persons and opportunity to be heard.

Employment of minors enrolled in a W.E.C.E.P. program approved pursuant to the requirements of this section shall be confined to not more than 23 hours in any week when school is in session and not more than three hours in any day when school is in session, any portion of which may be during school hours.

Employment of W.E.C.E.P. participants must not have the effect of displacing a worker in the establishment of the employer. Participants in W.E.C.E.P. must be paid according to the statutory minimum wage provision of the Fair Labor Standards Act.

V. Approval of Local Programs

Local school districts desiring approval to operate a W.E.C.E.P. program must submit an annual letter of application by June 30th to the

Michigan Department of Education
Vocational-Technical Education Service
Secondary Unit
Box 30009
Lansing, MI 48909
(517) 373-3365

VOCATIONAL WORK-STUDY

Definition and Purpose

The vocational work-study program is for those students who are in need of earnings from employment in order to commence or continue their vocational education programs.

Administration

The work-study program shall be administered by local educational agencies and made available, to the extent of available funds, to all qualified youth, in the area served by such agencies, who meet requirements.

Eligible Students

Employment under the work-study program shall be furnished only to a student who (a) has been accepted for enrollment or, if already enrolled, is in good standing and in full time attendance as a full-time student in a vocational education program which meets the standards of the state board and of the local educational agency and the requirements of the state plan, (b) is in need of the earnings from such employment to commence or continue a vocational education program, and (c) is at least 15 years of age and less than 21 years of age at the date of commencement of employment and is capable in the opinion of the appropriate school authorities of maintaining good standing in a school program while employed under the work-study program.

Limitation of Hours and Compensation of Employment

No student shall be employed under a vocational work-study program for more than 20 hours in any week in which classes in which the student is enrolled are in session. Summer employment shall not exceed 40 hours per week.

Employers

Employment under work-study programs shall be for the local educational agency or for some other public agency or institution, federal, state, or local and work so performed shall be adequately supervised and coordinated and shall not supplant present employees of such agency or institution who ordinarily perform such work. In those instances where employment under work-study programs is for a federal agency or institution, the written arrangement between the local educational agency and the federal agency or institution shall state that students so employed are not federal employees for any purpose.

Amounts Spent for Employment

In each fiscal year during which the work-study program remains in effect, the local educational agency shall expend for employment of its students an amount in state and/or local funds that is not less than the average annual expenditure for work-study programs of a similar nature during the three fiscal years preceding in which the supplementary plan provisons for its work study program are approved.

Applications, Priorities, and Approval

Work-study programs shall be approved on an individual basis by the state board and shall be consistent with the policies and procedures set forth.

Applications by Local Educational Agencies

Local educational agencies shall submit project proposals to the state board staff for approval in a manner similar to other vocational education programs.

Priority of Projects

Work-study programs will be provided, insofar as financial resources are available, for the undertaking of such programs in the order determined by the application of criteria for determining relative priority of projects which shall include preference for local educational agencies serving communities having substantial numbers of dropouts and unemployed youths and may include other relevant factors such as the extent to which the local educational agencies are using guidance and counseling and other related services designed to achieve the purposes of the work-study program.

MACHINE TOOL OCCUPATIONS
JOB TITLES

D.O.T.	JOB TITLE
607.682-010	Cut Off Saw Operator
705.684-010	Bench Grinder
602.482-010	Gear Lapping Machine Operator
603.664-010	Tool Grinder II
606.682-018	Drill Press Set-Up Operator, Single
606.380-010	Drill Press Set-Up Operator, Multiple
606.682-014	Drill Press Operator
609.380-014	Threading Machine Operator
604.280-018	Screw Machine Operator, Single
606.380-014	Drill Press Set-Up Operator, Radial
604.382-010	Screw Machine Operator, Multiple
605.382-010	Broaching Machine Set-Up Operator
603.382-018	Honing Machine Set-Up Operator
603.382-026	Lapping Machine Set-Up Operator
606.362-010	Drill Press Operator, Numerical Control
605.382-038	Shaper Set-Up Operator, Tool
604.280-018	Screw Machine Set-Up Operator
602.685-010	Gear Cutting Machine Operator, P
603.482-022	Grinder Set-Up Operator, Surface
604.380-026	Turret Lathe Set-Up Operator
602.380-010	Gear Cutting Machine Set-Up Operator
603.280-030	Grinder Set-Up Operator, Centerless
603.482-018	Grinder Set-Up Operator, Internal
603.482-014	Grinder Set-Up Operator, Ex. Tool
604.380-018	Engine Lathe Set-Up Operator
600.280-022	Machinist
600.380-018	Machine Set-Up Operator
609.482-010	Electro-Discharge Machine Operator
609.684-010	General Inspector
609.662-010	Numerical Machine Tool Operator
602.382-022	Gear Milling Machine Set-Up Operator
605.280-010	Milling Machine Set-Up Operator
222.367-062	Tool Crib Attendant
(NA)	Numerical Control Programmer/Operator

MACHINE TOOL OCCUPATIONS

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHET SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
A - 1																										X											
2	X								X		X						X			X					X	X	X		X	X		X	X				
3																										X											
4			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
5																										X	X										
6																										X											
B - 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
C - 1																																	X				
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
4			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
5																										X							X				
6																										X							X				

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR
D - 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4				X										X		X	
5				X	X	X	X			X					X	X	
6				X	X	X	X			X						X	
7				X	X	X	X		X	X	X		X		X		X
8				X												X	
9				X					X		X	X				X	X
10				X					X		X		X			X	
11			X	X					X		X		X	X		X	X
12				X	X	X	X			X						X	
13			X	X				X	X		X		X	X			X
14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

JOB TITLES	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHET SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR
D - 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4		X							X	X	X	X	X		X		
5	X								X			X			X		
6								X	X	X					X		
7			X			X		X	X	X	X	X	X		X		
8		X						X	X	X		X	X		X		
9		X	X			X	X	X	X	X	X	X	X		X		
10			X			X	X	X	X	X		X	X		X		
11		X	X			X	X	X	X	X	X	X	X		X		
12		X			X		X	X	X	X		X	X		X		
13	X	X	X	X		X	X	X	X			X	X	X	X		
14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHE SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR EX TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
E - 1																										X											
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
4																										X											
5																										X											
6																										X											
7																										X											
8																										X											
9																										X											
10																										X											
11																			X				X	X		X			X								
12																										X											
F - 1				X	X	X	X			X	X				X	X	X			X					X	X	X	X	X	X		X	X				
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHE SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
F - 7																										X											
G - 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
5													X													X											
6														X												X											
7																										X											
8					X	X	X			X																X											
9					X	X	X			X															X	X		X				X					
10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
11		X		X	X	X	X			X					X	X	X		X	X		X	X	X	X	X	X	X		X		X	X				
12				X												X									X	X	X					X	X				
13		X			X	X	X			X					X	X				X					X	X	X	X		X		X	X				

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER, II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHE SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
H - 1	X				X	X	X			X					X	X				X					X	X	X	X		X		X	X				
2	X				X	X	X			X					X	X				X					X	X	X	X		X		X	X				
3	X																									X	X						X				
4	X																									X	X						X				
5	X																									X	X						X				
6	X																									X	X						X				
7	X																									X	X						X				
8																										X	X						X				
9																										X	X						X				
10	X																									X	X						X				
11	X																									X	X						X				
12	X																									X	X						X				
13																										X	X						X				
I - 1					X	X	X			X					X											X	X	X		X			X				
2					X	X	X			X					X											X	X	X		X			X				
3					X	X	X			X					X											X	X	X		X			X				
4					X	X	X			X					X											X	X	X		X			X				

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHET SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
I - 5					X	X	X			X					X											X	X	X		X			X				
6					X	X	X			X					X											X	X	X		X			X				
7					X	X	X			X					X											X	X	X		X			X				
8				X	X	X	X			X					X											X	X	X		X			X				
9					X	X	X			X					X											X	X	X		X			X				
10					X	X	X			X					X											X	X	X		X			X				
11					X	X	X			X					X											X	X	X		X			X				
12					X	X	X			X					X											X	X	X		X			X				
13					X	X	X			X					X											X	X	X		X			X				
14					X	X	X			X					X											X	X	X		X			X				
15					X	X	X			X					X											X	X	X		X			X				
16					X	X	X			X					X											X	X	X		X			X				
J - 1									X		X						X			X					X	X	X	X		X							
2									X		X						X			X					X	X	X	X		X							
3				X					X		X						X			X					X	X	X	X		X							
4									X		X						X			X					X	X	X	X		X							
5																									X	X	X			X							
6																									X	X	X			X							

DUTY/TASK - JOB MATRIX

JOB TITLES DUTY/TASK NUMBERS	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHET SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
J - 7																									X	X	X	X		X							
8																				X					X	X	X	X		X							
9									X		X						X			X					X	X	X	X		X							
10									X		X						X			X					X	X	X	X		X							
11									X		X						X			X					X	X	X	X		X							
12									X		X						X			X					X	X	X	X		X							
13									X		X						X			X					X	X	X	X		X							
14									X		X						X			X					X	X	X	X		X							
15									X		X						X			X					X	X	X	X		X							
16									X		X						X			X					X	X	X	X		X							
17									X		X						X			X					X	X	X	X		X							
18																									X	X	X	X									
19																									X	X	X	X									
20																									X	X	X	X									
21																									X	X	X										
22																									X	X	X										
23																									X	X	X										
24																									X	X	X										

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHET SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
J - 25									X		X						X			X						X	X										
26									X		X						X			X					X	X	X			X							
27									X		X						X			X					X	X	X	X									
28																									X	X	X	X		X							
29									X		X						X			X					X	X	X			X							
30									X		X						X			X					X	X	X	X		X							
31																									X	X	X			X							
32																									X	X	X			X							
33																									X	X	X										
K - 1																										X	X	X		X		X					
2																										X	X	X		X		X					
3																										X	X	X		X		X					
4																										X	X	X		X		X					
5																										X	X	X		X		X					
6																										X	X	X		X		X					
7																										X	X	X		X		X					
8																										X	X	X		X		X					

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS \ JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHE SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR
K - 9																										X	X	X		X		X		
10																										X	X	X		X		X		
11																										X	X	X		X		X		
12																										X	X	X		X		X		
13																										X	X	X		X		X		
14																										X	X	X		X		X		
15																										X	X	X		X		X		
16																										X	X	X		X		X		
17																										X	X	X		X		X		
18																										X	X	X		X		X		
19																										X	X	X		X		X		
20																										X	X	X		X		X		
21																										X	X	X		X		X		
22																										X	X	X		X		X		
23																										X	X	X		X		X		
24																										X	X	X		X		X		
25																										X	X	X		X		X		
26																										X	X	X		X		X		

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS / JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHET SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
K - 27																										X	X	X		X		X					
28																										X	X	X		X		X					
29																										X	X	X				X					
30																										X	X	X		X	X	X					
31																										X	X	X		X	X	X					
32																										X	X	X		X		X					
33																										X	X	X		X		X					
34																										X	X	X				X					
35																										X	X	X				X					
36																	X									X	X	X	X	X	X	X					
L - 1																X										X	X										
2																X										X	X										
3																X										X	X										
4																X										X	X										
5																X										X	X										
6																X										X	X										
7																X										X	X										

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHE SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, FX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
L - 8																X										X	X										
9																X										X	X										
10																X										X	X										
M - 1		X		X																						X	X						X				
2		X		X																						X	X						X				
3		X		X																						X	X						X				
4		X		X																						X	X						X				
5				X	X	X	X		X	X	X				X	X	X			X					X	X	X			X		X	X				
6		X																								X	X						X				
7		X																								X	X						X				
8		X																								X	X	X					X				
N - 1				X															X							X	X			X							
2				X															X							X	X			X							
3				X															X							X	X			X							
4				X															X							X	X			X							
5				X															X							X	X			X							
6				X															X							X	X			X							

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHE SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
N - 7				X															X							X	X			X							
8				X															X							X	X			X							
9				X															X							X	X			X							
10				X															X							X	X			X							
11				X															X							X	X			X							
12				X															X							X	X			X							
13				X															X							X	X			X							
14				X																						X	X			X							
15				X															X							X	X			X							
16				X															X							X	X			X							
O - 1				X																		X	X	X		X	X			X							
2				X																		X	X	X		X	X			X							
3				X																		X	X	X		X	X			X							
4				X																		X	X	X		X	X			X							
5				X																		X	X	X		X	X			X							
6				X																		X	X	X		X	X			X							
7				X																		X	X	X		X	X			X							
8				X																		X	X	X		X	X			X							

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL·PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHET SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
O - 9				X																		X	X	X		X	X			X							
10				X																		X	X	X		X	X			X							
11				X																		X	X	X		X	X			X							
12				X																		X	X	X		X	X			X							
13				X																		X	X	X		X	X			X							
14				X																		X	X	X		X	X			X							
15				X																			X			X	X			X							
16				X																		X		X		X	X			X							
17				X																				X		X	X			X							
18				X																				X		X	X			X							
19				X																				X		X	X			X							
P - 1				X																						X											
2				X																						X											
3				X																						X											
4				X																						X											
5				X																						X											

DUTY/TASK - JOB MATRIX

DUTY/TASK NUMBERS

JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHE SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX. TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR			
Q - 1															X											X				X				X			
2															X											X				X				X			
3															X											X				X				X			
4															X											X				X				X			
5															X											X				X				X			
6															X											X				X				X			
7															X											X				X				X			
8															X											X				X				X			
9															X											X				X				X			
10															X											X				X							
11															X											X				X							
12															X											X				X							
13																																		X			
14																										X								X			
R - 1																										X	X	X									
2																										X	X	X									
3																										X	X	X									
4																										X	X	X									

DUTY/TASK - JOB MATRIX

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JOB TITLES	CUT OFF SAW OPERATOR	BENCH GRINDER	GEAR LAPPING MACHINE OPERATOR	TOOL GRINDER II	DRILL PRESS SET-UP OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, MULTIPLE	DRILL PRESS OPERATOR	THREADING MACHINE OPERATOR	SCREW MACHINE OPERATOR, SINGLE	DRILL PRESS SET-UP OPERATOR, RADIAL	SCREW MACHINE OPERATOR, MULTIPLE	BROACHING MACHINE SET-UP OPERATOR	HONING MACHINE SET-UP OPERATOR	LAPPING MACHINE SET-UP OPERATOR	DRILL PRESS OPERATOR, NUMERICAL CONTROL	SHAPER SET-UP OPERATOR, TOOL	SCREW MACHINE SET-UP OPERATOR	GEAR CUTTING MACHINE OPERATOR, P	GRINDER SET-UP OPERATOR, SURFACE	TURRET LATHET SET-UP OPERATOR	GEAR CUTTING MACHINE SET-UP OPERATOR	GRINDER SET-UP OPERATOR, CENTERLESS	GRINDER SET-UP OPERATOR, INTERNAL	GRINDER SET-UP OPERATOR, EX TOOL	ENGINE LATHE SET-UP OPERATOR	MACHINIST	MACHINE SET-UP OPERATOR	ELECTRO-DISCHARGE MACHINE OPERATOR	GENERAL INSPECTOR	NUMERICAL MACHINE TOOL OPERATOR	GEAR MILLING MACHINE SET-UP OPERATOR	MILLING MACHINE SET-UP OPERATOR	TOOL CRIB ATTENDANT	NUMERICAL CONTROL PROGRAMMER/OPERATOR
R - 5																										X	X	X						
6																										X	X	X						
7																										X	X	X						
8																										X	X	X						
9																										X	X	X						
10																										X	X	X						
S - 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
5				X																X				X	X	X	X	X		X	X	X		
6	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
7																										X	X			X				
8	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
9	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
10	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
11																										X	X							

TASK LIST FOR MACHINE TOOL OCCUPATIONS

A. ORGANIZING AND COORDINATING SHOP PRACTICES

1. Coordinate workers using job list to complete jobs.

2. Inventory supplies and materials using worksheet to record all items.

3. Determine supplies and materials needed using filing system to reorder if needed.

4. Inspect finished product using precision measuring tools to insure quality control standards.

5. Supervise machine use and operation using knowledge of trade to insure safety and quality control.

6. Supervise safety using knowledge of equipment to insure safe procedures in the shop.

B. PERFORMING PERSONAL SHOP PRACTICES

1. Develop safe work habits using knowledge of safety procedures to insure safety of self, others, and equipment.

2. Follow shop dress code using specified safety guide lines to insure personal safety.

3. Follow conduct rules using safety regulations to insure safety of persons in the shop.

4. Select tool using acquired knowledge to maximize safe working conditions.

C. PERFORMING TOOL CRIB OPERATIONS

1. Distribute and collect tools using knowledge to maintain tool control.

2. Store handtools using proper storage technique to maximize tool life.

3. Store various cutters using proper safety precautions to insure maximum tool life.

4. Store precision measuring instruments using proper safety precautions to insure prolonged accuracy.

5. Develop responsibilities using knowledge of tools to perform tool crib duties.

C. PERFORMING TOOL CRIB OPERATIONS (continued)

6. Maintain a running inventory of expendable items using inventory sheets to provide for replacing consumables.

D. PERFORMING MEASUREMENT/LAYOUT/INSPECTION OPERATIONS

1. Measure workpiece using fractional/decimal scale(s) to perform a layout or inspection.
2. Measure workpiece(s) using micrometer to determine actual size.
3. Measure workpiece using vernier/dial calipers to determine actual size.
4. Inspect workpiece(s) using dial test indicator to determine flatness and/or parallelism.
5. Measure angular features on workpiece using plain and vernier bevel protractors to perform a layout or inspection.
6. Perform precision layout using layout instrument, tools and equipment to prepare a part for machining.
7. Take measurement(s) using telescoping/small hole gages to determine diameters.
8. Take measurement(s) using an adjustable parallel or planer gage to inspect workpiece.
9. Transfer/compare measurement(s) using inside/outside calipers, radius/feeler gages to perform inspection.
10. Measure concentricity and eccentricity using an indicator and workholding device to perform an inspection operation.
11. Wring gage blocks using given dimension to assemble a specified height.
12. Inspect workpiece using a sine bar to determine specified angle.
13. Measure/compare features using an optical comparator to inspect shapes/sizes of workpiece.
14. Measure workpiece using metric measuring instruments to perform measurements.
15. Check measuring tool(s) using gage blocks to determine accuracy.

E. APPLYING METALLURGICAL PROCESSES

1. Define mechanical properties of steel using knowledge and reference materials to communicate within the technical language of the trade.

2. Identify steel using the spark testing method to determine the approximate alloy composition.

3. Determine the general hardness of a variety of metal samples using a file test to eliminate machinability of various materials.

4. Describe common alloy elements used in steels and non-ferrous materials using knowledge and reference sources to determine machinability and heat treatment practices.

5. Harden high carbon steel using a furnace and appropriate quenching medium to obtain desired hardness rating.

6. Carburize low carbon steel using available carburizing methods and furnace to prepare a workpiece for case hardening.

7. Case harden carburized workpieces using furnaces and quenching medium to produce a hard wear resistant surface of desired depth and hardness.

8. Determine proper temperature for hardening various alloys using reference materials to insure proper formation of metallurgical structures during the heat treatment processes.

9. Temper hardened workpiece(s) using furnace and reference materials to obtain desired mechanical properties.

10. Anneal hardened workpiece(s) using furnace and reference materials to obtain desired mechanical properties and hardness.

11. Test various alloys or test samples for hardness using a hardness tester to determine specific hardness.

12. Determine alloy elements of steel using SAE or AISI number codes to select proper heat treatment procedures.

F. INTERPRETING BLUEPRINTS

1. Make a freehand working drawing using the necessary views and other technical data to machine the part.

2. Interpret views done in orthographic projection using standard machine blueprints to obtain dimensions.

3. Calculate dimensions needed using given drawings to clarify blueprint information.

F. INTERPRETING BLUEPRINTS (continued)

4. Interpret section views using standard machine drawings to obtain information.
5. Translate notes/symbols/abbreviations using blueprints to interpret data.
6. Interpret tolerance using blueprint information to establish limits of dimensions.
7. Process part using work order, technical standards, and specifications to complete machining operation(s).

G. PERFORMING BENCH WORK

1. Saw workpiece using hand hacksaw to layout specifications.
2. Hand tap threads using tap wrench to produce internal threads.
3. Cut threads using die and diestock to produce external threads.
4. Repair equipment using proper tools to replace defective parts.
5. Hone workpiece surface using hand and precision tools to attain a micro-finish.
6. Lap workpiece surface using lapping compound to attain a micro-finish.
7. Ream hole(s) using hand reamer and tap wrench to produce a specific hole size.
8. Remove helical coil using proper tools to maximize fastener strength.
9. Remove damaged screw and/or other non-hardened threaded hardware using proper tools to restore original tapped fit.
10. Perform cross-filing operation on workpiece using appropriate file to obtain flat and square surface.
11. Dress and/or true pedestal grinding wheel using stone or star dress to sharpen the wheel.
12. Polish workpiece using appropriate abrasive cloth and oil to obtain a fine polish.
13. Grind excess metal using bench grinder to insure conformance in size and shape.

H. OPERATING POWER SAWS

1. Identify parts of power saws using knowledge to communicate in the technical language of the trade.

2. Perform preliminary maintenance and test using machine manual and/or knowledge to complete job requirements for safe operation and set up for a power cut-off saw.

3. Weld a band blade using a buttwelder to prepare the blade for installation.

4. Install band guides for appropriate band width using gages to insure proper operation of power cut-off saw.

5. Install band blades using tools and equipment to saw workpieces on various types of machines.

6. Set guide post(s) for proper clearance of workpiece using knowledge to insure accurate cutting of work.

7. Cut specified materials to length using a horizontal bandsaw to meet job specifications.

8. Saw contour using workpiece and sawing machine to cut to radius specified.

9. Lay out irregular shapes using appropriate layout tools and techniques to meet blueprint specifications.

10. Set power feeds for advancing workpiece into the saw using reference materials to insure maximum cutting efficiency.

11. Set up power saws using tools and/or manual to saw angles.

12. Set up stops and/or fences using manufacturer's procedures to maximize the efficiency of the machine.

13. Perform ban filing using the prescribed set up to produce proper size and shape workpiece.

I. OPERATING DRILL PRESSES

1. Label major parts of the drill press using drawing to identify various components.

2. Perform drill press maintenance using knowledge, tools, and equipment to prevent mechanical problems.

3. Layout holes using prick punch and center punch to determine desired hole location.

I. OPERATING DRILL PRESSES (continued)

4. Consider material of workpiece using reference materials and/or print to select proper drill size, speeds and feeds.
5. Drill hole using proper drill to required size.
6. Mount and secure work using proper holding device to perform drilling operations.
7. Ream hole using reamer to obtain desired size.
8. Sharpen drill using free hand method to obtain sharp and accurate ground drill.
9. Select proper tool(s) using knowledge of drill press operation(s) to perform required work.
10. Mount tools using chuck or taper in spindle to hold cutter.
11. Select sleeve using drill press spindle to determine proper size.
12. Spot-face workpiece using proper tool to produce flat right angle surface at hole.
13. Tap holes using tapping attachment to produce proper thread size.
14. Hand tap hole(s) using center in drill press spindle to start tap straight.
15. Drill hole using automatic feed to specific size.
16. Re-align off-center hole using prick punch, center punch, and chisel to correct location.

J. OPERATING LATHES

1. Label major parts of lathe using a drawing to communicate the technical language of the task.
2. Perform maintenance using knowledge of lathe to prevent mechanical problems.
3. Sharpen lathe tool(s) using pedestal grinder to attain desired tool geometry.
4. Mount tool holder, fixtures, or attachments using part shape, size and tolerance specifications to guide decision for specific lathe operations.
5. Align lathe centers using approximate method to attain proper alignment.

J. OPERATING LATHES (continued)

6. Align lathe using test bar to attain accurate alignment.
7. Mount work using dial test indicator to align workpiece in four jaw independent chuck.
8. Mount work using collet chuck to hold workpiece.
9. Select proper speeds and feeds using knowledge or reference materials to set proper RPM(s) and feed(s) for rough and finish turning.
10. Face workpiece using facing tool to square end to axis of part.
11. Perform center drilling using a center drill mounted in tail stock to prepare a workpiece for mounting between the centers.
12. Staight turn a workpiece using turning tools to produce a cylindrical shape.
13. Drill holes using proper tools and knowledge to meet blueprint specifications.
14. Ream hole(s) using tools and knowledge to meet blueprint specifications.
15. Countersink holes using countersink tool or compound rest to chamfer for receiving a flat head screw.
16. Counterbore holes using boring bar to specific depths and diameter.
17. Bore hole(s) using boring bar to enlarge and true holes.
18. Machine short external tapered surface using compound rest to produce a specified angle.
19. Machine external taper using taper attachment to produce a specified amount of taper.
20. Machine internal taper using taper attachment and boring bar to produce a specified amount of taper.
21. Single point chase external thread using tool bit and compound rest to meet blueprint specifications.
22. Single point chase internal threads using boring bar to meet blueprint specifications.
23. Rechase threads using lathe and single point tool to "pick up" incomplete thread form.

J. OPERATING LATHES (continued)

24. Cut threads on a lathe by hand using die in diestock to attain desired size.

25. Cut threads with lathe using expanding die heads to attain desired size.

26. Produce tapped hole using tap to attain desired thread size.

27. Perform form turning operation(s) using form tool to attain required shape.

28. Perform lathe filing using proper file to attain desired size and finish.

29. Knurl parts using knurling tool to provide gripping surface.

30. Part workpiece using cut off tool to separate workpiece from stock.

31. Support work using follower rest to keep long slender shafts from deflecting.

32. Support work using steady rest to permit access for machining ends of the part.

33. Set up grinding attachment using tool post grinder to finish grind workpiece.

K. OPERATING MILLING MACHINES, VERTICAL AND HORIZONTAL

1. Label parts using furnished drawing to identify components of vertical mill.

2. Label parts using furnished drawing to identify components of horizontal mill.

3. Perform maintenance using knowledge of milling machine to prevent mechanical problems.

4. Select and set speeds and feeds using machinery handbook or reference material to mill workpiece.

5. Perform climb and conventional milling using knowledge of cutter pressure in relation to lead screw(s).

6. Tram head of vertical mill using indicator, to align spindle.

7. Align milling machine vise using dial test indicator to attain the desired location on the machine table.

8. Select work-holding devices using knowledge and equipment to secure workpiece for machining.

K. OPERATING MILLING MACHINES, VERTICAL AND HORIZONTAL (continued)

9. Change arbors, adapters, and cutters using references and equipment to complete specific machining operations.

10. Identify/select cutters and tooling using references, cutters and tooling to meet specific machining requirements.

11. Square up workpiece using table vise to desired squareness.

12. Set up workpiece using wiggler edge finders and tools and equipment to locate reference corner.

13. Sweep holes and pins using equipment to locate centers.

14. Perform drilling using tools and equipment to produce desired holes in workpiece.

15. Perform reaming operation using reamer to size hole.

16. Counterbore/countersink/spotface workpiece using tools and equipment to meet blueprint specifications.

17. Countersink workpiece using tools and equipment to fit 82° flat head screw.

18. Spotface workpiece using proper size tool and equipment to blueprint specifications.

19. Bore hole using offset boring head to obtain a hole of desired tolerance.

20. Perform machining operation using flycutter to square workpiece.

21. Mill workpiece using end mill, to layout lines and/or desired dimensions.

22. Perform machining operation using form mill to obtain desired shape.

23. Perform cutting off operation using slitting saw cutter to obtain desired length of workpiece.

24. Perform straddle milling operation using horizontal mill to obtain desired width and depth.

25. Mill external key way using milling cutter to obtain desired size and shape.

26. Mill vertical/horizontal/angular surfaces using tools and equipment to machine three different planes.

27. Mill workpiece using angle plate and sine bar to obtain desired angle.

28. Identify milling machine attachments using tools and equipment to machine workpiece using each attachment.

K. OPERATING MILLING MACHINES, VERTICAL AND HORIZONTAL (continued)

29. Shape internal slots using slotter and attachments to obtain desired size.

30. Perform indexing operation using dividing head to obtain desired number of divisions.

31. Mill gears using dividing head to obtain desired shape.

32. Mill cylindrical work using rotary table to obtain desired shape.

33. Mill internal and external radii using rotary table to obtain desired shape.

34. Align right angle milling attachment using dial test indicator to obtain desired tolerance on workpiece.

35. Machine workpiece using tracing attachment and pattern to produce a finished part.

36. Inspect complete milled workpiece using precision measuring instruments to print specifications.

L. OPERATING SHAPERS

1. Identify parts of shaper using knowledge to communicate the technical language of the trade.

2. Perform preliminary maintenance and tests using knowledge and equipment to complete requirements for safe operation and set up of a shaper.

3. Position clapper box in proper relationship using knowledge and tools to cutting edge and feed direction to maximize tool life.

4. Select speeds and feeds using knowledge and equipment to maximize cutting efficiency.

5. Sharpen shaper cutting tools using off-hand, single point tool sharpening techniques to meet job requirements.

6. Select/position the length of the Ram stroke using knowledge and equipment to maximize cutting efficiency.

7. Shape workpiece square and parallel using tools and equipment to meet blueprint specifications.

8. Shape an angular surface by using the tool head to meet blueprint specifications.

L. OPERATING SHAPERS (continued)

9. True a vise parallel or perpendicular to the ram travel using dial indicators in order to produce work which will meet blueprint specifications.

10. Set up workpiece using workholding accessories to produce parts within blueprint specifications.

M. OPERATING PEDESTAL GRINDING MACHINES

1. Mount grinding wheel using proper tools to prepare machine for safe operation.

2. Adjust tool rest and guards to compensate for wheel wear using knowledge and tools to maintain a safe operating machine.

3. Dress grinding wheel using a "Star" or "Stick" dresser to expose new sharp cutting edges on the abrasives within the wheel.

4. Renew the cutting edges of a chisel and screw driver using off-hand grinding techniques to obtain original tool angles.

5. Grind drills, high-speed steel lathe and shaper tools from blanks by obtaining proper tool angles.

6. Mount polishing or buffing wheel on a pedestal grinder using proper tools to prepare machine for safe operation.

7. Polish/buff parts using proper compounds to meet job specifications.

8. Operate/maintain belt grinder using knowledge to grind workpiece to specifications.

N. OPERATING SURFACE GRINDING MACHINES

1. Perform preliminary maintenance and tests using knowledge and tools to complete requirements for safe operation and set-up of a surface grinding machine.

2. Identify the major parts and accessories of a surface grinder using acquired knowledge to communicate within the technical language of the trade.

3. Identify/surface grinding wheels using the standard wheel marking system to select proper wheel to meet job requirements.

4. Inspect and test a grinding wheel using the "Ring Test" to eliminate damaged wheels.

N. OPERATING SURFACE GRINDING MACHINES (continued)

5. Dress wheel for the production of flat surface using a dresser to meet surface finish requirements.

6. Form dress a wheel for the production of an angle or radius using proper dressing attachments to create a part feature to specifications.

7. Set feed reversing dogs for proper table travel using knowledge and tools to complete job requirements.

8. Select proper table travel speeds and feed rates using knowledge to insure proper and safe operation to complete job requirements.

9. Perform surface grinding using permanent or electromagnetic chuck to produce two surfaces flat and parallel within the blueprint specifications.

10. Perform surface grinding using a precision angle plate to produce surfaces at 90° angles within blueprint specifications.

11. Perform surface grinding of a precision angle using a sine plate or sine chuck to meet blueprint specifications.

12. Perform surface grinding of a part surface using a "cup wheel" to produce a right angle wall.

13. Perform surface grinding operations using grinding hold-downs or blocking techniques to insure a solid set-up of thin or irregular workpieces.

14. Perform grinding of a narrow slot using a cut-off abrasive wheel to meet blueprint specifications.

15. Perform proper clean-up and securing of the machine to prevent corrosion of table slides upon completion of job.

16. Diagnose surface grinding problems using knowledge and equipment to meet job specifications.

O. OPERATING CYLINDRICAL GRINDING MACHINES

1. Perform preliminary maintenance and tests using knowledge and tools to complete requirements for safe operation and set-up of a cylindrical grinder.

2. Identify the major parts of a cylindrical grinder using acquired knowledge to communicate within the specialized language of the trade.

3. Identify grinding wheels using the standard wheel marking system to select grinding wheels for job requirements.

O. OPERATING CYLINDRICAL GRINDING MACHINES (continued)

4. Test condition of a grinding wheel using the "ring test" to eliminate unsafe or damaged wheels.

5. Balance a grinding wheel using the proper equipment to insure required surface finish specifications during grinding operations.

6. Dress wheel for specific applications using a dresser to true sharpen a grinding wheel.

7. Test grind a workpiece using knowledge and tools to produce the desired taper on the workpiece.

8. Mount work in a four-jaw chuck using dial indicators to adjust for run-out.

9. Measure workpiece using proper measurement techniques to determine the amount of grind stock.

10. Select proper length of table travel and set reversing "dogs" using knowledge and tools to insure proper table traverse during cylindrical grinding operation.

11. Select proper rotation and speed for cylindrical grinding using knowledge of cylindrical grinding to obtain proper surface finish requirements.

12. Select proper longitudinal feedrate using knowledge to obtain proper surface finish requirements.

13. Set proper"dwell time" at the end of longitudinal travel using machine control settings to meet job specifications.

14. Perform outside straight cylindrical grinding using tools and equipment to produce a straight cylindrical workpiece.

15. Perform inside cylindrical grinding using tools and equipment to produce a straight inside cylinder.

16. Perform external taper grinding using an outside cylindrical grinder to grind an external taper to specifications.

17. Grind a shoulder perpendicular to the axis of rotation using an outside cylindrical grinder to obtain specified length requirements.

18. Grind an external cylinder using a workpiece mounted on a mandrel to meet blueprint specifications.

19. Grind a precision external cylinder using steady rest to insure elimination of work deflection.

P. OPERATING TOOL AND CUTTER GRINDING MACHINES

1. Sharpen cutter using proper grinding wheels to attain original angles.
2. Set up cutter using mandrels to hold cutters during sharpening.
3. Set up cutter using collets to hold cutters during sharpening.
4. Set tooth rest in proper relationship to cutter using knowledge and tools to obtain proper angles.
5. Grind proper angles on single point tools using a grinder to meet job specifications.

Q. PROGRAMMING AND OPERATING NUMERICAL CONTROL MACHINES

1. Identify parts of a Numerical Control (N/C) Mill, Lathe or Drilling machine using knowledge to communicate the technique language of the trade.
2. Perform preliminary maintenance of a N/C machine using machine manuals to insure proper operation of the machine.
3. Plot points of coordinates using the Cartesian Coordinate System to demonstrate machine positioning systems.
4. Convert blueprint dimensioned by traditional methods to N/C dimensioning using knowledge to prepare the part for N/C programming.
5. List various input mediums used to program N/C machines using reference materials to gain a knowledge of systems available to industry.
6. Decipher American Standard for Coding Information Interchange (ASCII) and Electronics Industries Association Codes (EIA) using a sample piece of perforated tape to troubleshoot tape reader or punch failure.
7. Write a manuscript using a prescribed N/C format to program a machine to manufacture a part.
8. Edit a tape using proper tape making equipment to manufacture a part to specifications.
9. Edit a part program which has been loaded into memory using edit commands to manufacture a part to specifications.
10. Set-up tools using a manuscript to obtain proper gage lengths to manufacturer parts.
11. Proof a program using a "Dry Running" programmed N/C machine to insure proper machine movement to produce a part to specifications.

Q. PROGRAMMING AND OPERATING NUMERICAL CONTROL MACHINES (continued)

12. Machine a part using a N/C machine to complete a part to blueprint specifications.

13. Locate a given diameter cutter at the start and end of an angled surface using trigonometry to establish proper cutting path.

14. Perform mathematical calculations using knowledge of circular interpolation to machine a radius to specifications.

R. OPERATING ELECTRO-DISCHARGE MACHINES (EDM)

1. Identify major parts of an EDM machine using knowledge and training to communicate the technical language of non-traditional machining processes.

2. Perform maintenance on EDM machine using machine manual to maximize operating machine efficiency.

3. Demonstrate principles of EDM using knowledge and training to complete a machined workpiece.

4. Select proper amount of amphere and voltage using knowledge of EDM practices to machine workpiece to surface finish and tolerance requirements.

5. Select proper method of applying dielectric fluid using knowledge of machining operation to result in the most efficient method for completing part.

6. Choose correct electrode relative to size and shape using knowledge of materials to machine effectively and efficiently a workpiece.

7. Set-up machine using knowledge of overcut, feed rate, and current requirements to produce correct size detail on workpiece.

8. Set machine up for desired metal removal rate using recommended current to obtain gap voltage for stabilizing the cut.

9. Set machine controls using knowledge of amperage, frequency, capacitance, and gap voltage to obtain correct surface finish for workpiece.

10. Evaluate the machining characteristics of a given workpiece using knowledge to determine time and cost of the EDM process.

S. MAINTAINING MACHINES AND TOOLS

1. Clean shop facility using proper tools to insure cleanliness and safety.

2. Clean/maintain personal work area using proper materials to insure good working conditions.

S. MAINTAINING MACHINES AND TOOLS (continued)

3. Dispose of scrap metal and trash using proper cleaning materials to insure clean shop and safe working conditions.

4. Inspect work area using knowledge of shop safety practices to insure safe working environment.

5. Perform maintenance on arbor press using manual to determine needed information.

6. Select coolants, cutting oils, or compounds for machining operation(s) using machinist handbook tables to obtain better tool life.

7. Inspect/repair hand tools using knowledge of tools to repair defective parts.

8. Inspect/replace/adjust machine guards using operator and maintenance manual to meet OSHI standards.

9. Perform preventive maintenance using appropriate supplies and equipment to maximize equipment life.

10. Perform machine repair using service manual and proper tools to repair machine.

11. Level/relevel machine(s) using master precision level to maintain machine accuracy.

T. USING EMPLOYABILITY SKILLS

1. Investigate employment information using sources of employment information to identify employment opportunities.

2. Identify job requirements using health, physical, legal, education, and other occupational information to determine the requirements of an occupation.

3. Acquire wage information using available resources to determine the approximate entry wages, general wage range, and significant fringe benefits for an occupation.

4. Identify significant non-wage job characteristics using available resources to determine shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment and other significant job factors.

5. Explore employment opportunities using available resources to describe local, regional, and national employment opportunities for an occupation.

T. USING EMPLOYABILITY SKILLS (continued)

6. Analyze career ladder using available resources to describe job progression in an occupation.
7. Identify personal criteria with information about available alternatives using a decision-making situation and procedures and skills in decision-making to choose a job, further training or other alternatives.
8. Prepare a resume using personal information to apply for a job.
9. Write a letter of application using personal notes to apply/inquire about a job.
10. Complete a job application using personal notes to apply for a job.
11. Demonstrate appropriate dress using a knowledge of job requirements to comply with standards of on-the-job dress and grooming.
12. Complete a job interview using communication and interpersonal skills to become employed.
13. Describe personal criteria using references to identify acceptable job offers.
14. Demonstrate interpersonal skills to achieve successful relationships with others.
15. Identify source of continuing education for an occupation using available resources to identify career ladder alternatives.
16. Describe job termination procedures using a knowledge of the occupational area to leave a particular job.

Duty: Organizing and Coordinating Shop Practices	**Duty No.** A **Task No.** 1

Task: Coordinate workers using job list to complete jobs.

Achievement Indicators: The learner:	Yes	No
1. Handed out job assignments to workers from job list -		
2. Explained desired outcome of job to each worker -		
3. Assisted any worker needing help with job -		
4. Followed up to make sure jobs were progressing on schedule -		
5. Observed safety of each worker -		
6. Recorded all completed work on job list -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the shop supervisor's standards.

Tools and Equipment:	**Resources:**

Duty: Organizing and Coordinating Shop Practices	**Duty No.** A **Task No.** 2

Task: Inventory supplies and materials using worksheet to record all items.

Achievement Indicators: The learner:	Yes	No
1. Inventoried all expendable items using inventory sheet -	____	____
2. Located and counted each item on inventory sheet -	____	____
3. Turned in inventory sheets to shop supervisor for recording if needed -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Organizing and Coordinating Shop Practices	**Duty No.** A **Task No.** 3

Task: Determine supplies and materials needed using filing system to reorder if needed.

Achievement Indicators: The learner:

	Yes	No
1. Recorded supplies and materials needed from inventory sheet -	____	____
2. Filled out order for supplies and materials needed -	____	____
3. Received and checked in new supplies coming in -	____	____
4. Updated supplies and material files -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the supervisor's request.

Tools and Equipment:	**Resources:**

Duty: Organizing and Coordinating Shop Practices

Duty No. A

Task No. 4

Task: Inspect finished product using precision measuring tools to insure quality control standards.

Achievement Indicators: The learner:

	Yes	No
1. Inspected finished parts according to blueprint specifications -	____	____
2. Sorted out any parts not meeting blueprint specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to quality control standards.

Tools and Equipment:

Precision measuring tools

Resources:

Duty: Organizing and Coordinating Shop Practices	**Duty No.** A **Task No.** 5

Task: Supervise machine use and operation using knowledge of trade to insure safety and quality control.

Achievement Indicators: The learner:

	Yes	No
1. Determined proper machine to be used -	____	____
2. Eliminated any safety problems -	____	____
3. Assisted any worker with incorrect machine set-up -	____	____
4. Checked proper feeds and speeds -	____	____
5. Made sure correct tooling was used -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:	**Resources:**

Duty: Organizing and Coordinating Shop Practices	**Duty No.** A **Task No.** 6

Task: Supervise safety using knowledge of equipment to insure safe procedures in the shop.

Achievement Indicators: The learner:	Yes	No
1. Inforced all safety rules and regulations in shop -	____	____
2. Locked out any machine unsafe to use in shop -	____	____
3. Supervised getting unsafe machines back in working order -	____	____
4. Used OSHI standards -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to OSHI standards.

Tools and Equipment:	**Resources:**

Duty: Performing Personal Shop Practices

Duty No. B

Task No. 1

Task: Develop safe work habits using knowledge of safety procedures to insure safety of self, others, and equipment.

Achievement Indicators: The learner:

	Yes	No
1. Followed all safety rules -	____	____
2. Cleaned work area -	____	____
3. Wore protective clothing and eye protection -	____	____
4. Used machine guards when provided -	____	____
5. Used proper tools and machines -	____	____
6. Used only machines on which instruction had been given -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop safety codes.

Tools and Equipment:

Resources:

Duty: Performing Personal Shop Practices	**Duty No.** B
	Task No. 2

Task: Follow shop dress code using specified safety guide lines to insure personal safety.

Achievement Indicators: The learner:

	Yes	No
1. Wore safety glasses or face shields -	____	____
2. Removed rings, watches, bracelets, etc. -	____	____
3. Wore short sleeves or rolled sleeves up above elbows -	____	____
4. Wore proper shoes -	____	____
5. Did not wear loose clothing -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to OSHA standards.

Tools and Equipment:

Resources:

Duty: Performing Personal Shop Practices	**Duty No.** B **Task No.** 3

Task: Follow conduct rules using safety regulations to insure safety of persons in the shop.

Achievement Indicators: The learner:

	Yes	No
1. Avoided horseplay in shop -	_____	_____
2. Concentrated on own work while in shop -	_____	_____
3. Encouraged other to work safely in shop -	_____	_____
4. Did not run in the shop -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to supervisor standards/OSHA safety standards.

Tools and Equipment:

Resources:

Duty: Performing Personal Shop Practices	**Duty No.** B **Task No.** 4

Task: Select tool using acquired knowledge to maximize safe working conditions.

Achievement Indicators: The learner:	Yes	No
1. Selected proper tools for job -	____	____
2. Used tools properly -	____	____
3. Stored and cleaned tool -	____	____
4. Adjusted tools when needed -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:	**Resources:**

Duty: Performing Tool Crib Operations	**Duty No.** C **Task No.** 1

Task: Distribute and collect tools using knowledge to maintain tool control.

Achievement Indicators: The learner:

	Yes	No
1. Distributed tools in accordance with prescribed tool crib shop system -	____	____
2. Collected all tools in accordance with prescribed shop system -	____	____
3. Stored tools and machine accessories in proper locations -	____	____
4. Took inventory of all tools to determine if any are missing -	____	____
5. Inventoried expendable items and replenished same -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed successfully according to industrial standards 100% of the time.

Tools and Equipment:

Resources:

Duty: Performing Tool Crib Operations

Duty No. C

Task No. 2

Task: Store handtools using proper storage technique to maximize tool life.

Achievement Indicators: The learner:

	Yes	No
1. Removed oil, grease, metals, or other materials from handtools -	____	____
2. Returned each tool to its proper location in the tool crib -	____	____
3. Handled and stored tools in a manner to prevent deterioration -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards 100% of the time.

Tools and Equipment:

Resources:

Duty: Performing Tool Crib Operations

Duty No. C

Task No. 3

Task: Store various cutters using proper safety precautions to insure maximum tool life.

Achievement Indicators: The learner:

	Yes	No
1. Followed safety precautions in handling cutters -	_____	_____
2. Removed oil, grease, metal, or other material from cutters -	_____	_____
3. Returned each cutter to its proper location in the tool crib -	_____	_____
4. Handled cutters carefully in order to prevent dulling -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards 100% of the time.

Tools and Equipment:

Resources:

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Duty: Performing Tool Crib Operations	**Duty No.** C **Task No.** 4

Task: Store precision measuring instruments using proper safety precautions to insure prolonged accuracy.

Achievement Indicators: The learner:

	Yes	No
1. Handled each tool carefully to maintain its accuracy -	____	____
2. Removed oil, grease, or sundry other materials from all tools before storing -	____	____
3. Stored all precision tools to proper location in the tool crib -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards 100% of the time.

Tools and Equipment:

Resources:

Duty: Performing Tool Crib Operations	**Duty No.** C **Task No.** 5

Task: Develop responsibilities using knowledge of tools to perform tool crib duties.

Achievement Indicators: The learner:

	Yes	No
1. Operated tool crib as instructed -	____	____
2. Handled tools in a manner to prevent deterioration -	____	____
3. Maintained cleanliness of tools -	____	____
4. Stored tools properly -	____	____
5. Maintained an accurate account of all tools -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards 100% of the time.

Tools and Equipment:	**Resources:**

Duty: Performing Tool Crib Operations

Duty No. C

Task No. 6

Task: Maintain a running inventory of expendable items using inventory sheets to provide for replacing consummables.

Achievement Indicators: The learner:

	Yes	No
1. Kept an inventory of expendable items in tool crib -	_____	_____
2. Replaced expendable items in tool crib as needed -	_____	_____
3. Maintained an ongoing inventory record as instructed -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards 100% of the time.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations	**Duty No.** D **Task No.** 1

Task: Measure workpiece using fractional/decimal scale(s) to perform a layout or inspection.

Achievement Indicators: The learner:

	Yes	No
1. Measured overall length of flat workpiece -	____	____
2. Measured location of slot(s) on workpiece -	____	____
3. Measured depth of slot(s) on workpiece -	____	____
4. Measured diameter and depth(s) of holes -	____	____
5. Measured outside diameter of cylindrical workpiece -	____	____
6. Measured lengths of shoulders of cylindrical workpiece -	____	____
7. Set height of surface gage scriber with scale and squaring head (combination square) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and tolerances of the blueprint.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations	**Duty No.** D **Task No.** 2

Task: Measure workpiece(s) using micrometer to determine actual size.

Achievement Indicators: The learner:

	Yes	No
1. Calibrated micrometers using standards -	____	____
2. Determined overall height, length, and width of flat workpiece (outside micrometer) -	____	____
3. Determined diameters of cylindrical workpiece (outside micrometer) -	____	____
4. Determined depth of slots, pockets, steps and/or counter bores (depth micrometer) -	____	____
5. Determined inside diameters of cylinders (inside micrometer) -	____	____
6. Determined amount of taper on flat workpieces -	____	____
7. Determined taper on cylindrical workpieces -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and tolerance on blueprint.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 3

Task: Measure workpiece using vernier/dial calipers to determine actual size.

Achievement Indicators: The learner:

	Yes	No
1. Calibrated vernier caliper/dial caliper with standards -	____	____
2. Determined overall length, width, and height of flat workpiece -	____	____
3. Determined location of slot on flat workpiece -	____	____
4. Determined width of slot on a flat workpiece -	____	____
5. Determined depth of slot on a flat workpiece -	____	____
6. Determined size diameters on cylindrical workpiece -	____	____
7. Determined diameters of holes or cylinders -	____	____
8. Determined if parts were within blueprint specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and blueprint specifications.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 4

Task: Inspect workpiece(s) using dial test indicator to determine flatness and/or parallelism.

Achievement Indicators: The learner

	Yes	No
1. Cleaned surface plate -	____	____
2. De-burred work -	____	____
3. Mounted dial indicator on surface gage or height gage -	____	____
4. Determined height variation on part surfaces -	____	____
5. Recorded height variations -	____	____
6. Accepted or rejected workpiece according to specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and blueprint specifications.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 5

Task: Measure angular features on workpiece using plain and vernier bevel protractors to perform a layout or inspection.

Achievement Indicators: The learner:

	Yes	No
1. Deburred workpiece -	____	____
2. Selected protractor head or vernier bevel protractor -	____	____
3. Determined the proper setting the protractor should show from the blueprint -	____	____
4. Determined the actual angle on the part -	____	____
5. Accepted or rejected the part according to the tolerances given -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of the shop supervisor and blueprint specifications.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 6

Task: Perform precision layout using layout instrument, tools and equipment to prepare a part for machining.

Achievement Indicators: The learner:	Yes	No
1. Cleaned surface plate and deburred work -	____	____
2. Coated work with layout dye -	____	____
3. Mounted work with suitable work holding device if necessary -	____	____
4. Set height gage for desired dimensions -	____	____
5. Scribed lines on work to describe part features -	____	____
6. Scribed angles using vernier bevel protractor or protractor head -	____	____
7. Scribed arcs and circles using dividers or tranimel points -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and blueprint specifications.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 7

Task: Take measurement(s) using telescoping/small hole gages to determine diameters.

Achievement Indicators: The learner:

	Yes	No
1. Deburred workpiece -	____	____
2. Selected proper size telescoping or small hole gage -	____	____
3. Inserted gage into hole and obtained diameter of hole -	____	____
4. Transferred measurement to micrometer -	____	____
5. Determined size of the hole by the micrometer measurement -	____	____
6. Determined "out of roundness" by repeating the above steps -	____	____
7. Determined taper by repeating the above steps -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of the shop supervisor and blueprint specifications.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations	**Duty No.** D **Task No.** 8

Task: Take measurement(s) using an adjustable parallel or planer gage to inspect workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Cleaned and deburred workpiece -	____	____
2. Inserted adjustable parallel into slot -	____	____
3. Obtained dimension, over adjustable parallel with outside micrometer -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 9

Task: Transfer/compare measurement(s) using inside/outside calipers, radius/feeler gages to perform inspection.

Achievement Indicators: The learner:

	Yes	No
1. Adjusted outside caliper over a cylindrical part to proper "feel" -	____	____
2. Compared caliper opening to a fractional or decimal scale -	____	____
3. Determined actual size of the workpiece -	____	____
4. Adjusted inside caliper to the diameter of a hole with the proper "feel" -	____	____
5. Compared caliper opening to fractional or decimal scale -	____	____
6. Determined actual size of the hole -	____	____
7. Compared a fillet or round (or similar part feature) to radius gages to determine actual radius -	____	____
8. Determined the width of a narrow slot by inserting the proper feeler, gage or combination of feeler into the slot -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and blueprint specifications.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 10

Task: Measure concentricity and eccentricity using an indicator and workholding device to perform an inspection operation.

Achievement Indicators: The learner:

	Yes	No
1. Deburred workpiece -	____	____
2. Mounted workpiece in appropriate workholding device -	____	____
3. Mounted dial indicator in appropriate workholding device -	____	____
4. Rotated work 360° -	____	____
5. Determined amount of "run out" -	____	____
6. Compared amounts of "run out" to all diameters on the part -	____	____
7. Determined concentricity diameters on the part to each other -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 11

Task: Wring gage blocks using given dimension to assemble a specified height.

Achievement Indicators: The learner:	Yes	No
1. Determined total height of gage block stack -	____	____
2. Determined gage blocks needed to make up total stack -	____	____
3. Selected and cleaned each individual block from the gage block set -	____	____
4. Assembled the blocks by "wringing" them together -	____	____
5. Disassembled the gage blocks and cleaned each surface -	____	____
6. Replaced into the set in proper location -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 12

Task: Inspect workpiece using a sine bar to determine specified angle.

Achievement Indicators: The learner:

	Yes	No
1. Determined angle required from the blueprint -	____	____
2. Calculated height of gage block stack -	____	____
3. Selected and cleaned gage blocks needed -	____	____
4. Assembled gage blocks by ringing -	____	____
5. Cleaned surface plate, sine bar and work -	____	____
6. Mounted dial indicator on surface gage -	____	____
7. Mounted work and sine bar on gage block stack -	____	____
8. Swept dial indicator over angled surface -	____	____
9. Determined accuracy of angle -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and blueprint specifications.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 13

Task: Measure/compare features using an optical comparator to inspect shapes/sizes of workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Deburred workpiece -	____	____
2. Mounted work in acceptable workholding device on comparator table -	____	____
3. Mounted acceptable screen on comparator -	____	____
4. Measured linear length dimensions -	____	____
5. Measured hole locations -	____	____
6. Measured angular dimensions -	____	____
7. Measured diameters of cylindrical pieces -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and blueprint specifications.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 14

Task: Measure workpiece using metric measuring instruments to perform measurements.

Achievement Indicators: The learner:

	Yes	No
1. Inspected workpiece(s) for accuracy using the following metric instrument:		
a. scale -	____	____
b. outside micrometers -	____	____
c. inside micrometers -	____	____
d. depth micrometers -	____	____
e. vernier caliper -	____	____
f. vernier height gage -	____	____
2. Compared measurements to blueprint -	____	____
3. Accepted or rejected the part based upon blueprint dimensions and tolerances -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor and blueprint specifications.

Tools and Equipment:

Resources:

Duty: Performing Measurement/Layout/Inspection Operations

Duty No. D

Task No. 15

Task: Check measuring tool(s) using gage blocks to determine accuracy.

Achievement Indicators: The learner:	Yes	No
1. Calibrated outside micrometers with gage blocks -		
2. Calibrated vernier calipers with gage blocks -		
3. Calibrated inside micrometers using standards -		
4. Calibrated depth micrometers using gage blocks -		
5. Calibrated vernier height gage using gages -		
6. Calibrated "snap gage" using gage blocks -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 1

Task: Define mechanical properties of steel using knowledge and reference materials to communicate within the technical language of the trade.

Achievement Indicators: The learner:

	Yes	No
1. Defined correctly:		
a. hardening -	____	____
b. critical temperature -	____	____
d. quenching -	____	____
e. tempering -	____	____
f. annealing -	____	____
g. casehardening -	____	____
h. carburizing -	____	____
i. stress -	____	____
j. tensile strength -	____	____
k. elasticity -	____	____
l. ductility -	____	____
m. toughness -	____	____
n. hardness -	____	____
o. (not shortness) -	____	____
p. (not hardness) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 2

Task: Identify steel using the spark testing method to determine the approximate alloy composition.

Achievement Indicators: The learner: Yes No

1. Selected samples to be tested - _____ _____
2. Spark tested each sample and compared it to chart furnished or to known samples - _____ _____
3. Labeled each unknown sample - _____ _____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 3

Task: Determine the general hardness of a variety of metal samples using a file test to eliminate machinability of various materials.

Achievement Indicators: The learner:

	Yes	No
1. Selected samples to be file tested -	____	____
2. Identified each sample as:		
a. free machining -	____	____
b. medium machining -	____	____
c. hard to machine -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 4

Task: Describe common alloy elements used in steels and non-ferrous materials using knowledge and reference sources to determine machinability and heat treatment practices.

Achievement Indicators: The learner:

	Yes	No
1. Identified the following elements:		
a. oxygen -	____	____
b. carbon -	____	____
c. silicon -	____	____
d. manganese -	____	____
e. sulphur -	____	____
f. phosphorous -	____	____
g. chromium -	____	____
h. nickel -	____	____
i. tungsten -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 5

Task: Harden high carbon steel using a furnace and appropriate quenching medium to obtain desired hardness rating.

Achievement Indicators: The learner:

	Yes	No
1. Preheated the source (furnace, forge, etc.) -	____	____
2. Placed high carbon steel in furnace with tongs -	____	____
3. Heated steel to critical temperature (1400-1700°F or cherry red) -	____	____
4. Quenched steel in appropriate media -	____	____
5. Reheated to temper -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 6

Task: Carburize low carbon steel using available carburizing methods and furnace to prepare a workpiece for case hardening.

Achievement Indicators: The learner:

The learner:	Yes	No
1. Prepared a container with hardening compound (kasenite, hard fast) -	____	____
2. Preheated furnace -	____	____
3. Placed workpiece in furnace with tongs -	____	____
4. Heated to critical temperature -	____	____
5. Submerged steel in compound until cool -	____	____
6. Reheated workpiece to critical temperature -	____	____
7. Quenched steel in water -	____	____
8. Checked hardness of steel -	____	____
9. Tempered workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to hardening compound specifications.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 7

Task: Case harden carburized workpieces using furnaces and quenching medium to produce a hard wear resistant surface of desired depth and hardness.

Achievement Indicators: The learner:

	Yes	No
1. Prepared container with proper charcoal -	____	____
2. Packed part(s) in container and seal (with fine brick amount) -	____	____
3. Placed container and packed part in furnace -	____	____
4. Drought part up to temperature -	____	____
5. Allowed part to soak desired time to obtain proper depth penetration -	____	____
6. Removed part from container -	____	____
7. Reheated to critical temperature -	____	____
8. Quenched part to harden -	____	____
9. Checked hardness of part -	____	____
10. Tempered workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes	**Duty No.** E **Task No.** 8

Task: Determine proper temperature for hardening various alloys using reference materials to insure proper formation of metallurgical structures during the heat treatment processes.

Achievement Indicators: The learner:	Yes	No
1. Selected samples to be hardened -	____	____
2. Used reference materials:		
a. iron carbide equilibrium diagram -	____	____
b. machinist handbook -	____	____
c. steel manufacturer's data sheets -	____	____
3. Determined hardening temperature for samples -	____	____
4. Hardened each sample -	____	____
5. Checked hardness with Rockwell hardness testers -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the data compiled from reference materials available.

Tools and Equipment:	**Resources:**

Duty: Applying Metallurgical Processes	**Duty No.** E **Task No.** 9

Task: Temper hardened workpiece(s) using furnace and reference materials to obtain desired mechanical properties.

Achievement Indicators: The learner:

	Yes	No
	____	____
1. Used reference materials:		
a. iron, iron carbide equilibrium diagram -	____	____
b. machinist handbook -	____	____
c. steel manufacturer's data sheets -	____	____
2. Determined desired hardness and properties -	____	____
3. Tempered workpiece(s) to desired properties and hardness -	____	____
4. Checked hardness with Rockwell hardness test -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to data compiled from reference materials available.

Tools and Equipment:	**Resources:**

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 10

Task: Anneal hardened workpiece(s) using furnace and reference materials to obtain desired mechanical properties and hardness.

Achievement Indicators: The learner:

	Yes	No
1. Selected samples to be annealed -	____	____
2. Used reference materials:		
a. iron, iron carbide equilibrium diagram -	____	____
b. machinist handbook -	____	____
c. steel manufacturer's data sheets -	____	____
3. Annealed workpiece(s) to desired properties -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to data compiled from reference materials available.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 11

Task: Test various alloys or test samples for hardness using a hardness tester to determine specific hardness.

Achievement Indicators: The learner:

	Yes	No
1. Deburred and removed scale from workpiece -	____	____
2. Selected proper penetrator for test sample hardness -	____	____
3. Mounted proper amount of "load" or weight for type of penetrator -	____	____
4. Selected and installed proper anvil on the tester -	____	____
5. Applied proper "pre-load" to penetrator -	____	____
6. Released load and re-set hardness tester -	____	____
7. Read hardness on proper scale of the hardness tested -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Applying Metallurgical Processes

Duty No. E

Task No. 12

Task: Determine alloy elements of steel using SAE or AISI number codes to select proper heat treatment procedures.

Achievement Indicators: The learner:

	Yes	No
1. Determined the major alloying elements by the first digit of the SAE or AISI number code -	____	____
2. Determined the amount of second major alloying elements by the second digit of the SAE or AISI number code -	____	____
3. Determined the carbon content by the last two digits of the SAE or AISI number code -	____	____
4. Listed all specific ingredients of a material (using reference material) for a given SAE or AISI number code -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Interpreting Blueprints	**Duty No.** F **Task No.** 1

Task: Make a freehand working drawing using the necessary views and other technical data to machine the part.

Achievement Indicators: The learner:

	Yes	No
1. Sketched front, right side, and top views needed to manufacture a part with standard view relationships -	____	____
2. Dimensioned views needed to manufacture the part	____	____
3. Sketched an assembly if necessary to show part relationships -	____	____
4. Sketched additional sections or full views to communicate needed information -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:	**Resources:**

Duty: Interpreting Blueprints

Duty No. F

Task No. 2

Task: Interpret views done in orthographic projection using standard machine blueprints to obtain dimensions.

Achievement Indicators: The learner:

	Yes	No
1. Interpreted top, front, and side view relationships to each other -	____	____
2. Transferred dimensions from view to view -	____	____
3. Interpreted object, center, hidden, phantom, and dimension lines -	____	____
4. Traced hidden lines and surfaces to view(s) showing as solid lines -	____	____
5. Interpreted schematic or simplified thread representations -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part being manufactured to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Interpreting Blueprints

Duty No. F

Task No. 3

Task: Calculate dimensions needed using given drawings to clarify blueprint information.

Achievement Indicators: The learner:

	Yes	No
1. Located indirectly dimensioned part features -	____	____
2. Transferred dimensions from various views to obtain missing dimensions -	____	____
3. Made necessary calculations to obtain correct dimensions on the part -	____	____
4. Converted fractions to decimals -	____	____
5. Converted angular locations to datum locations where necessary -	____	____
6. Made all calculations necessary to manufacture the part within tolerance -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part being manufactured to blueprint specifications.

Tools and Equipment:

Resources:

Duty:	Interpreting Blueprints	**Duty No.**	F
		Task No.	4

Task: Interpret section views using standard machine drawings to obtain information.

Achievement Indicators: The learner:

	Yes	No
1. Recognized full, half, offset, broken out, revolved, and removed sectional views -	____	____
2. Transferred dimensions from solid views -	____	____
3. Recognized cutting plane lines -	____	____
4. Recognized the treatment of hidden lines in sectioned views -	____	____
5. Recognized the treatment of ribs, webs, and spokes in sections -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the part being manufactured to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Interpreting Blueprints

Duty No. F

Task No. 5

Task: Translate notes/symbols/abbreviations using blueprints to interpret data.

Achievement Indicators: The learner:	Yes	No
1. Recognized and defined all general notes on blueprint -	____	____
2. Recognized and defined all specific notes on blueprint -	____	____
3. Recognized all thread notation and interpreted all necessary dimensions -	____	____
4. Interpreted print revision block -	____	____
5. Interpreted print title block information -	____	____
6. Interpreted all standard abbreviations found on the blueprint -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part being manufactured to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Interpreting Blueprints

Duty No. F

Task No. 6

Task: Interpret tolerance using blueprint information to establish limits of dimensions.

Achievement Indicators: The learner:

	Yes	No
1. Recognized general tolerance information from title block -	____	____
2. Recognized features with specific deviations from general tolerances -	____	____
3. Recognized geometric tolerance symbols -	____	____
4. Recognized datum surfaces -	____	____
5. Chose proper machinery operations to obtain tolerances -	____	____
6. Recognized effect tolerances have on order of operations used to make the part -	____	____
7. Interpreted surface finish symbols -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part being manufactured to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Interpreting Blueprints	**Duty No.** F **Task No.** 7

Task: Process part using work order, technical standards, and specifications to complete machining operation(s).

Achievement Indicators: The learner:

	Yes	No
1. Listed (in any order) the machining operations needed to complete the part -	____	____
2. Relisted (in the proper order) machining operations needed to complete the part -	____	____
3. Noted all tooling needed to manufacture the part -	____	____
4. Noted all fixturing techniques needed to manufacture the part -	____	____
5. Drew sketches where necessary for determining clamping and locating -	____	____
6. Estimated machining time for each operation -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:	**Resources:**

Duty: Performing Bench Work	**Duty No.** G **Task No.** 1

Task: Saw workpiece using hand hacksaw to layout specifications.

Achievement Indicators: The learner: Yes No

1. Inspected blade tooth set and sharpness - ____ ____
2. Secured workpiece properly - ____ ____
3. Sawed workpiece to layout specifications - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed successfully according to shop supervisor's standards.

Tools and Equipment:	**Resources:**

Duty: Performing Bench Work

Duty No. G

Task No. 2

Task: Hand tap threads using tap wrench to produce internal threads.

Achievement Indicators: The learner:	Yes	No
1. Located and center-punched hole location -	____	____
2. Secured workpiece properly -	____	____
3. Selected and used correct size tap drill -	____	____
4. Used proper lubricant -	____	____
5. Maintained squareness when tapping hole -	____	____
6. Completed hole was tapped according to specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed successfully according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Performing Bench Work

Duty No. G

Task No. 3

Task: Cut threads using die and diestock to produce external threads.

Achievement Indicators: The learner:

	Yes	No
1. Chamfered end of workpiece -	____	____
2. Selected and used proper die -	____	____
3. Used proper lubricant -	____	____
4. Maintained squareness of die stock to result in straight threads -	____	____
5. Finished workpiece was in accordance to specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed successfully according to industrial standards.

Tools and Equipment:

Resources:

Duty: Performing Bench Work	**Duty No.** G **Task No.** 4

Task: Repair equipment using proper tools to replace defective parts.

Achievement Indicators: The learner:	Yes	No
Disassembly		
1. Turned off electrical power -	____	____
2. Determined section(s) to be disassembled -	____	____
3. Removed fasteners -	____	____
4. Disassembled in correct sequence -	____	____
Assembly		
1. Assembled components in correct sequence -	____	____
2. Replaced part(s) according to specifications -	____	____
3. Replaced all fasteners -	____	____
4. Made necessary adjustments (as applicable) -	____	____
5. Lubricated to specifications (as applicable) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Performing Bench Work

Duty No. G

Task No. 5

Task: Hone workpiece surface using hand and precision tools to attain a micro-finish.

Achievement Indicators: The learner:

	Yes	No
1. Referred to print for part specifications -	____	____
2. Selected proper honing tool(s) -	____	____
3. Set up workpiece accurately -	____	____
4. Used lubricant (as applicable) -	____	____
5. Honed workpiece in accordance with specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed successfully according to industrial standards.

Tools and Equipment:

Resources:

Duty: Performing Bench Work	**Duty No.** G **Task No.** 6

Task: Lap workpiece surface using lapping compound to attain a micro-finish.

Achievement Indicators: The learner:

	Yes	No
1. Referred to print for part specifications -	____	____
2. Selected proper lapping tool(s) -	____	____
3. Set up workpiece accurately -	____	____
4. Used lubricant (as applicable) -	____	____
5. Lapped workpiece in accordance with specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Performing Bench Work

Duty No. G

Task No. 7

Task: Ream hole(s) using hand reamer and tap wrench to produce a specific hole size.

Achievement Indicators: The learner: Yes No

Hand Reaming

1. Secured workpiece properly - ____ ____
2. Selected proper reamer - ____ ____
3. Mounted reamer in tap wrench - ____ ____
4. Lubricated (as applicable) and reamed to specifications - ____ ____

Hand Reaming With Drill Press

1. Secured workpiece properly - ____ ____
2. Selected proper reamer - ____ ____
3. Mounted lathe center and align to T-tap wrench - ____ ____
4. Lubricated (as applicable) and reamed to specifications - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Performing Bench Work	**Duty No.** G **Task No.** 8

Task: Remove helical coil using proper tools to maximize fastener strength.

Achievement Indicators: The learner:

	Yes	No
1. Secured workpiece properly -	____	____
2. Removed worn or damaged helical coil (STI) -	____	____
3. Selected proper tap (STI) -	____	____
4. Cleaned and re-tapped threads -	____	____
5. Selected proper helical coil (STI) -	____	____
6. Inerted and checked according to specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Performing Bench Work	**Duty No.** G **Task No.** 9

Task: Remove damaged screw and/or other non-hardened threaded hardware using proper tools to restore original tapped fit.

Achievement Indicators: The learner:	Yes	No
1. Secured workpiece properly -	____	____
2. Center-punched -	____	____
3. Selected appropriate drill and drill holes -	____	____
4. Used correct screw extractor to remove damaged parts -	____	____
5. Inspected and re-tapped to maintain original fit -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Performing Bench Work	**Duty No.** G **Task No.** 10

Task: Perform cross-filing operation on workpiece using appropriate file to obtain flat and square surface.

Achievement Indicators: The learner:

	Yes	No
1. Secured workpiece properly -	____	____
2. Selected file -	____	____
3. Filed workpiece flat and square -	____	____
4. Used file card to keep file clean -	____	____
5. Maintained layout (as applicable) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Performing Bench Work

Duty No. G

Task No. 11

Task: Dress and/or true pedestal grinding wheel using stone or star dress to sharpen the wheel.

Achievement Indicators: The learner:	Yes	No
1. Inspected wheel for cracks -	____	____
2. Insured that all safety equipment was in place -	____	____
3. Adjusted gap between workrest and wheel -	____	____
4. Used stone or star dresser to dress and true wheel -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Performing Bench Work

Duty No. G

Task No. 12

Task: Polish workpiece using appropriate abrasive cloth and oil to obtain a fine polish.

Achievement Indicators: The learner:

	Yes	No
1. Selected a medium grade abrasive cloth (coarse if needed) -	____	____
2. Placed cloth under a block of wood -	____	____
3. Applied a few drops of oil to the abrasive and polished -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Performing Bench Work

Duty No. G

Task No. 13

Task: Grind excess metal using bench grinder to insure conformance in size and shape.

Achievement Indicators: The learner:

	Yes	No
1. Inspected wheel for cracks and trueness -	____	____
2. Insured that all safety equipment was in place -	____	____
3. Checked gap between workrest and wheel -	____	____
4. Performed rough and finish grinding operations as necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Power Saws

Duty No. H

Task No. 1

Task: Identify parts of power saws using knowledge to communicate in the technical language of the trade.

Achievement Indicators: The learner:

	Yes	No
1. Identified the parts of a power horizontal band sawing machine -	____	____
2. Identified the parts of a vertical band sawing machine -	____	____
3. Identified the parts of a reciprocating power back saw -	____	____
4. Identified the parts of an abrasive cut-off saw -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Power Saws

Duty No. H

Task No. 2

Task: Perform preliminary maintenance and test using machine manual and/or knowledge to complete job requirements for safe operation and set up for a power cut-off saw.

Achievement Indicators: The learner:

	Yes	No
1. Lubricated machine as necessary -	____	____
2. Inspected condition of blade -	____	____
3. Inspected machine guards, adjusted as necessary -	____	____
4. Checked coolant level, filled as necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Power Saws

Duty No. H

Task No. 3

Task: Weld a band blade using a buttwelder to prepare the blade for installation.

Achievement Indicators: The learner:

		Yes	No
1.	Measured the required band blade to length from a bulk roll -	____	____
2.	Cut the ends of the band square -	____	____
3.	Removed scale/oil/dirt from band -	____	____
4.	Ground teeth off blade for proper tooth spacing -	____	____
5.	Set welding temperature, upset force, and upset distance for the band width -	____	____
6.	Welded ends of band together -	____	____
7.	Annealed weld zone -	____	____
8.	Ground "flash" away -	____	____
9.	Tested thickness of weld effected area -	____	____
10.	Tested band for flexability -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to supervisor's standards.

Tools and Equipment:

Resources:

Duty: Operating Power Saws

Duty No. H

Task No. 4

Task: Install band guides for appropriate band width using gages to insure proper operation of power cut-off saw.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper band guides for the band width selected -	____	____
2. Removed improper guides and stored in proper location -	____	____
3. Cleaned guide seats as necessary -	____	____
4. Installed proper guides using alignment gages and thickness gages -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of the machine manual and/or shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Power Saws	**Duty No.** H **Task No.** 5

Task: Install band blades using tools and equipment to saw workpieces on various types of machines.

Achievement Indicators: The learner:

	Yes	No
1. Secured power to saw -	____	____
2. Removed guards necessary to replace bands -	____	____
3. Placed band in machine with teeth heading in proper direction -	____	____
4. Set blade preliminary blade tension -	____	____
5. Replaced guards -	____	____
6. Reenergized power to machine -	____	____
7. "Tracked blade" on tires -	____	____
8. Set sawing blade tension -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the machine manual and/or shop supervisor.

Tools and Equipment:	**Resources:**

Duty: Operating Power Saws

Duty No. H

Task No. 6

Task: Set guide post(s) for proper clearance of workpiece using knowledge to insure accurate cutting of work.

Achievement Indicators: The learner:

	Yes	No
1. Determined width or thickness of work to be sawed -	____	____
2. Placed work in vise or machine table -	____	____
3. Adjusted guide post position with proper clearance of workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Power Saws	**Duty No.** H **Task No.** 7

Task: Cut specified materials to length using a horizontal bandsaw to meet job specifications.

Achievement Indicators: The learner:	Yes	No
1. Secured work in vise or to machine table according to crossection shape -	____	____
2. Selected proper band width and pitch according to work shape and thickness -	____	____
3. Set stock length stop for repeated lengths -	____	____
4. Set band speed and feed rates for job requirements -	____	____
5. Sawed parts to proper length and squareness -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the job requirements.

Tools and Equipment:	**Resources:**

Duty: Operating Power Saws

Duty No. H

Task No. 8

Task: Saw contour using workpiece and sawing machine to cut to radius specified.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper width and pitch blade for radius to be cut -	____	____
2. Mounted blade into machine -	____	____
3. Selected proper attachments to feed work into band -	____	____
4. Drilled necessary holes in work -	____	____
5. Fabricated band blade through workpiece as necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards and workpiece is sawed within 1/32" of layout line.

Tools and Equipment:

Resources:

Duty: Operating Power Saws	**Duty No.** H **Task No.** 9

Task: Lay out irregular shapes using appropriate layout tools and techniques to meet blueprint specifications.

Achievement Indicators: The learner:	Yes	No
1. Selected proper layout tools to perform layout of work shape -	____	____
2. Performed proper layout techniques to draw accurate layout lines -	____	____
3. Maximized material usage during layout -	____	____
4. Center punched layout lines to indicate part boundary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Power Saws

Duty No. H

Task No. 10

Task: Set power feeds for advancing workpiece into the saw using reference materials to insure maximum cutting efficiency.

Achievement Indicators: The learner:

	Yes	No
1. Determined thickness of material to be cut -	____	____
2. Determined alloying elements to be cut -	____	____
3. Determined proper pitch of band blade -	____	____
4. Clamped workpiece to fixture, vise or table as required -	____	____
5. Adjusted power feed mechanism (hydraulic or mechanical) to advance band or table at proper rate -	____	____
6. Adjusted pressure over-ride valves (if necessary) -	____	____
7. Removed and stored accessories at completion of job -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to machine manuals, blueprint specifications of part and/or shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Power Saws

Duty No. H

Task No. 11

Task: Set up power saws using tools and/or manual to saw angles.

Achievement Indicators: The learner:	Yes	No
1. Adjusted vise or fixture to proper angle to the blade -	____	____
2. Tilted machine table to proper angle -	____	____
3. Selected and installed proper blade -	____	____
4. Set saw guides to accommodate workpiece -	____	____
5. Set speeds and feeds for material to be cut -	____	____
6. Cut work to proper length -	____	____
7. Cut work to the proper angle -	____	____
8. Realigned the vise, fixture or machine table to original 90° angle -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Power Saws	**Duty No.** H
	Task No. 12

Task: Set up stops and/or fences using manufacturer's procedures to maximize the efficiency of the machine.

Achievement Indicators: The learner:	Yes	No
1. Determined length of stock needed to complete job -	____	____
2. Selected proper machine stock stop or fence needed -	____	____
3. Aligned and installed the stop or fence the proper distance from the blade -	____	____
4. Cut material to length -	____	____
5. Removed stops or fences and stored in proper location -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the work being done within the blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Power Saws	**Duty No.** H **Task No.** 13

Task: Perform ban filing using the prescribed set up to produce proper size and shape workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper band file -	____	____
2. Installed the band file properly -	____	____
3. Set machine speed -	____	____
4. Checked alignment of machine table -	____	____
5. Filed work to layout lines -	____	____
6. Periodically cleaned band teeth during filing operation -	____	____
7. Removed and properly stored band file -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications and shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses	**Duty No.** I **Task No.** 1

Task: Label major parts of the drill press using drawing to identify various components.

Achievement Indicators: The learner:

1. Identified:

	Yes	No
a. motor -	____	____
b. base -	____	____
c. column -	____	____
d. table -	____	____
e. spindle -	____	____
f. head -	____	____
g. quill -	____	____
h. quill lock -	____	____
i. depth stop -	____	____
j. power feed control (if applicable) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the supervisor.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 2

Task: Perform drill press maintenance using knowledge, tools, and equipment to prevent mechanical problems.

Achievement Indicators: The learner:

	Yes	No
1. Cleaned machine of all chips, dirt and oil -	____	____
2. Inspected all moving parts -	____	____
3. Lubricated according to service manual specifications -	____	____
4. Cleaned and stored attachments -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 3

Task: Layout holes using prick punch and center punch to determine desired hole location.

Achievement Indicators: The learner:

	Yes	No
1. Completed hole layout location(s) according to specifications -	____	____
2. Prick-punched all layout -	____	____
3. Center-punched all hole layout location(s) accurately to ± .010 -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 4

Task: Consider material of workpiece using reference materials and/or print to select proper drill size, speeds and feeds.

Achievement Indicators: The learner:	Yes	No
1. Referred to blueprint for identification of material to be drilled -	____	____
2. Referred to appropriate reference materials to determine cutting speed -	____	____
3. Determined drill size to be used -	____	____
4. Referred to charts, tables, etc. to determine speeds and feeds -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to Machinery's Handbook, drill charts and/or textbook.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 5

Task: Drill hole using proper drill to required size.

Achievement Indicators: The learner:

	Yes	No
1. Identified workpiece material and cutting speed -	____	____
2. Secured workpiece -	____	____
3. Selected speeds for various drills used -	____	____
4. Aligned workpiece and center-drilled -	____	____
5. Selected and mounted proper drill -	____	____
6. Set proper machine speed -	____	____
7. Drilled to dimensions (lubricate, if applicable) -	____	____
8. Deburred hole -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 6

Task: Mount and secure work using proper holding device to perform drilling operations.

Achievement Indicators: The learner:

	Yes	No
1. Selected and mounted proper work-holding device -	____	____
2. Selected appropriate clamps (if applicable) -	____	____
3. Secured work in work-holding device -	____	____
4. Tapped workpiece to insure seating -	____	____
5. Tightened table lock (if applicable) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 7

Task: Ream hole using reamer to obtain desired size.

Achievement Indicators: The learner:	Yes	No
1. Identified workpiece material and cutting speed -	____	____
2. Secured workpiece -	____	____
3. Selected speeds -	____	____
4. Aligned workpiece and center-drilled -	____	____
5. Selected and mounted proper drill -	____	____
6. Set proper machine speed -	____	____
7. Drilled undersize hole (lubricate if applicable) -	____	____
8. Selected and mounted proper reamer -	____	____
9. Selected proper machine speed -	____	____
10. Reamed hole to desired size (lubricate) -	____	____
11. Deburr (as necessary) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 8

Task: Sharpen drill using free hand method to obtain sharp and accurate ground drill.

Achievement Indicators: The learner:

	Yes	No
1. Dressed and trued grinding wheel -	____	____
2. Ground lip clearance, lip angle to specifications -	____	____
3. Determined accuracy, using drill grinding gage -	____	____
4. Adhered to grinding safety throughout -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 9

Task: Select proper tool(s) using knowledge of drill press operation(s) to perform required work.

Achievement Indicators: The learner:

	Yes	No
1. Studied blueprint to determine drilling operations -	____	____
2. Noted operations -	____	____
3. Sequenced operations -	____	____
4. Selected proper drilling assortment of tools to perform the required work -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses	**Duty No.** I **Task No.** 10

Task: Mount tools using chuck or taper in spindle to hold cutter.

Achievement Indicators: The learner:	Yes	No
Straight Shank Holders:		
1. Cleaned shank of chuck -	____	____
2. Aligned tong of chuck into drill press spindle -	____	____
3. Secured chuck into spindle -	____	____
4. Secured tool/cutter into chuck -	____	____
5. Performed operation -	____	____
6. Inserted drift and removed chuck -	____	____
Taper Shank Holders:		
1. Cleaned shank of tool/cutter -	____	____
2. Cleaned spindle hole of drill press -	____	____
3. Secured tool/cutter into drill press spindle -	____	____
4. Performed operation -	____	____
5. Inserted drift and removed tool/cutter -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Operating Drill Presses

Duty No. I

Task No. 11

Task: Select sleeve using drill press spindle to determine proper size.

Achievement Indicators: The learner:

	Yes	No
1. Determined drill press spindle hole diameter by tapered shank size -	____	____
2. Measured large diameter of drill taper -	____	____
3. Obtained proper tapered sleeve from tool crib -	____	____
4. Inserted tapered shank of drill into tapered sleeve -	____	____
5. Inserted tapered sleeve into drill press spindle -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 12

Task: Spot-face workpiece using proper tool to produce flat right angle surface at hole.

Achievement Indicators: The learner:

	Yes	No
1. Identified workpiece material -	____	____
2. Selected holding device and accessories -	____	____
3. Secured workpiece -	____	____
4. Aligned workpiece -	____	____
5. Spot-faced workpiece to specifications (lubricate) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 13

Task: Tap holes using tapping attachment to produce proper thread size.

Achievement Indicators: The learner:	Yes	No
1. Referred to print to determine the threaded hole size -	____	____
2. Selected proper size tap drill -	____	____
3. Secured workpiece -	____	____
4. Set speed and center drilled locations -	____	____
5. Set speed and feed (if necessary) -	____	____
6. Drilled hole(s) -	____	____
7. Mounted and secured tapping attachment -	____	____
8. Selected proper machine speed -	____	____
9. Tapped hole(s) to specification using lubrication -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses

Duty No. I

Task No. 14

Task: Hand tap hole(s) using center in drill press spindle to start tap straight.

Achievement Indicators: The learner:	Yes	No
1. Secured workpiece -	____	____
2. Set speed and center drilled -	____	____
3. Selected tap drill -	____	____
4. Set speed on feed -	____	____
5. Drilled hole(s) -	____	____
6. Mounted dead-center in drill chuck -	____	____
7. Mounted tap in T-tap wrench -	____	____
8. Aligned center point of dead-center to center-hole of T-tap wrench -	____	____
9. Turned tap handle by hand while keeping pressure against the tap with the dead center -	____	____
10. Applied adequate tapping lubricant -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Drill Presses	**Duty No.** I **Task No.** 15

Task: Drill hole using automatic feed to specific size.

Achievement Indicators: The learner:	Yes	No
1. Referred to print for hole specifications -	____	____
2. Secured workpiece -	____	____
3. Secured tool -	____	____
4. Positioned tool on workpiece location -	____	____
5. Determined and set feed -	____	____
6. Engaged power feed and performed drill press operation -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Operating Drill Presses

Duty No. I

Task No. 16

Task: Re-align off-center hole using prick punch, center punch, and chisel to correct location.

Achievement Indicators: The learner:

	Yes	No
1. Determined and re-located correct center -	____	____
2. Prick punched and center punched location -	____	____
3. Chiseled, as necessary, one or more grooves toward correct center -	____	____
4. Fed the drill into the workpiece slowly to allow it to pick up the new center -	____	____
5. Completed the drilling operation to specifications (using lubricant as necessary) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 1

Task: Label major parts of lathe using a drawing to communicate the technical language of the task.

Achievement Indicators: The learner:

1. Located major parts of the lathe on furnished drawing:

	Yes	No
a. spindle nose -	____	____
b. head stock -	____	____
c. tail stock -	____	____
d. ways -	____	____
e. quick change gear box -	____	____
f. saddle -	____	____
g. carriage -	____	____
h. carriage hand wheel -	____	____
i. cross feed hand wheel -	____	____
j. compound -	____	____
k. half nut lever -	____	____
l. thread chasing dial -	____	____
m. cross feed engagement lever -	____	____
n. tool post -	____	____
o. motor start switch -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Operating Lathes	**Duty No.** J
	Task No. 2

Task: Perform maintenance using knowledge of lathe to prevent mechanical problems.

Achievement Indicators: The learner:

	Yes	No
1. Inspected lathe for maintenance and/or minor repairs needed -	____	____
2. Cleaned machine -	____	____
3. Lubricated machine -	____	____
4. Made minor repairs and/or adjustments -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to repair manual.

Tools and Equipment:	**Resources:**
Lathe Wrenches	

Duty: Operating Lathes

Duty No. J

Task No. 3

Task: Sharpen lathe tool(s) using pedestal grinder to attain desired tool geometry.

Achievement Indicators:

The learner:	Yes	No
1. Positioned tool properly in relation to wheel -	____	____
2. Ground proper clearance angles -	____	____
3. Cooled tool when necessary -	____	____
4. Performed safely on pedestal grinder -	____	____
5. Dressed wheel if necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to supervisor's standards.

Tools and Equipment:

Tool Bit
Pedestal Grinder
Wheel Dresser

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 4

Task: Mount tool holder, fixtures, or attachments using part shape, size and tolerance specifications to guide decision for specific lathe operations.

Achievement Indicators:

The learner:	Yes	No
1. Determined machining operation to be performed -	____	____
2. Selected correct tool, tool holder, fixture, or attachment -	____	____
3. Secured attachment to specification necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Lathe
Tool Holders
Cutting Tools

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 5

Task: Align lathe centers using approximate method to attain proper alignment.

Achievement Indicators:

The learner:	Yes	No
1. Mounted centers in head stock -	____	____
2. Checked center alignment -	____	____
3, Adjusted tail stock to align centers -	____	____
4. Checked witness marks for alignment -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Lathe & Accessories

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 6

Task: Align lathe using test bar to attain accurate alignment.

Achievement Indicators: The learner:

	Yes	No
1. Mounted test bar between centers -	____	____
2. Mounted dial indicator on compound -	____	____
3. Checked alignment with indicator -	____	____
4. Made necessary adjustments to with in .0005 -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to procedure sheet.

Tools and Equipment:

Lathe & Accessories
Dial Indicator
Test Bar

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 7

Task: Mount work using dial test indicator to align workpiece in four jaw independent chuck.

Achievement Indicators: The learner:

	Yes	No
1. Aligned work by sight with concentric grooves in fore of chuck -	____	____
2. Aligned work by sight with end of tool holder or some type of point -	____	____
3. Aligned by adjusting opposite jaws -	____	____
4. Indicated work to within .0005 of an inch -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Lathe & Accessories

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 8

Task: Mount work using collet chuck to hold workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper size collet for workpiece -	____	____
2. Mounted workpiece in collet -	____	____
3. Adjusted collet to hold workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Lathe & Accessories

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 9

Task: Select proper speeds and feeds using knowledge or reference materials to set proper RPM(s) and feed(s) for rough and finish turning.

Achievement Indicators: The learner:

	Yes	No
1. Identified workpiece material -	____	____
2. Identified cutting tool material -	____	____
3. Selected proper speed and feed from handbook tables -	____	____
4. Considered other factors such as:		
a. Workpiece hardness -	____	____
b. Tool hardness -	____	____
c. Rigidity of machine and set-up -	____	____
d. Cutting fluids to be used -	____	____
e. Depth of cut -	____	____
5. Set machine to take roughing cut(s) -	____	____
6. Set machine to take finish cut(s) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Lathe & Accessories
Tool Bits

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 10

Task: Face workpiece using facing tool to square end to axis of part.

Achievement Indicators: The learner:

	Yes	No
1. Mounted chuck if necessary -	____	____
2. Mounted work in chuck -	____	____
3. Indicated work if necessary -	____	____
4. Mounted facing tool and tool holder -	____	____
5. Centered tool to workpiece -	____	____
6. Selected and set speeds and feeds -	____	____
7. Faced off end of workpiece until it is square with axis -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:
Lathe & Accessories
Indicator
Tool Bit

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 11

Task: Perform center drilling using a center drill mounted in tail stock to prepare a workpiece for mounting between centers.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper size drill and reamer -	____	____
2. Selected proper speed(s) and feeds -	____	____
3. Chucked stock in lathe -	____	____
4. Center drilled workpiece -	____	____
5. Drilled hole(s) to specifications -	____	____
6. Reamed hole(s) to specifications -	____	____
7. Used cutting oil when applicable -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Lathe & Accessories
Combination Drill & Countersink
Drill
Reamer

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 12

Task: Straight turn a workpiece using turning tools to produce a cylindrical shape.

Achievement Indicators: The learner:	Yes	No
1. Mounted workpiece between centers -	____	____
2. Selected proper feeds and speeds -	____	____
3. Selected proper turning tool (sharpen if necessary) -	____	____
4. Positioned tool on or slightly above center of work -	____	____
5. Checked workpiece for taper after first cut (adjust if necessary) -	____	____
6. Machined workpiece to specific size -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Turning Tool

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 13

Task: Drill holes using proper tools and knowledge to meet blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Chucked workpiece -	____	____
2. Selected proper tools -	____	____
3. Selected proper speeds for drilling and reaming -	____	____
4. Centered drilled workpiece -	____	____
5. Drilled workpiece to under reamed size -	____	____
6. Reamed to specific size -	____	____
7. Used proper cutting fluid -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:	**Resources:**
Lathe & Accessories Centerdrill Drill Reamer	

Duty:	Operating Lathes	**Duty No.** J **Task No.** 14

Task: Ream hole(s) using tools and knowledge to meet blueprint specifications.

Achievement Indicators:

The learner:	Yes	No
1. Chucked workpiece -	____	____
2. Selected proper tools -	____	____
3. Selected proper speeds -	____	____
4. Center drilled workpiece -	____	____
5. Drilled hole(s) to correct diameter -	____	____
6. Reamed hole(s) to specifications -	____	____
7. Used proper cutting fluid -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Centerdrill
Drill
Reamer

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 15

Task: Countersink holes using countersink tool or compound rest to chamfer for receiving a flat head screw.

Achievement Indicators: The learner:

	Yes	No
1. Chucked workpiece -	____	____
2. Selected proper size tool -	____	____
3. Selected proper speeds for following operations:		
a. Face off workpiece -	____	____
b. Center drill workpiece -	____	____
c. Drill workpiece -	____	____
d. Countersink workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Center Drill
Drill
82° Countersink

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 16

Task: Counterbore holes using boring bar to specific depths and diameter.

Achievement Indicators: The learner:

The learner:	Yes	No
1. Chucked work in lathe -	____	____
2. Selected proper size boring bar -	____	____
3. Mounted boring bar -	____	____
4. Adjusted stop to depth of bore -	____	____
5. Selected and set proper speed(s) and feed(s) -	____	____
6. Roughed bore -	____	____
7. Checked size -	____	____
8. Finished bore to specified dimension -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:	**Resources:**
Lathe & Accessories Boring Bar Drill Center Drill	

Duty: Operating Lathes

Duty No. J

Task No. 17

Task: Bore hole(s) using boring bar to enlarge and true holes.

Achievement Indicators:

The learner:	Yes	No
1. Checked work in lathe -		
2. Selected proper size boring bar -		
3. Selected angle set lathe speed(s) and feed(s) -		
4. Center drilled workpiece (if necessary) -		
5. Drilled (if necessary) -		
6. Face work -		
7. Bore work to specific size -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Boring bar
Drill
Center Drill

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 18

Task: Machine short external tapered surface using compound rest to produce a specified angle.

Achievement Indicators: The learner:	Yes	No
1. Chucked work -	____	____
2. Adjusted compound rest to required angle -	____	____
3. Adjusted tool and tool holder to center of work -	____	____
4. Selected proper speed and feed -	____	____
5. Turned desired taper -	____	____
6. Checked taper and adjusted (if necessary) to ± ½ degree -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:	**Resources:**
Lathe & Accessories Turning Tool	

Duty: Operating Lathes

Duty No. J

Task No. 19

Task: Machine external taper using taper attachment to produce a specified amount of taper.

Achievement Indicators:

The learner:	Yes	No
1. Chucked work -	____	____
2. Selected speed(s) and feed(s) -	____	____
3. Center drilled work -	____	____
4. Faced work (if desired) -	____	____
5. Mounted work between centers -	____	____
6. Adjusted taper attachment to desire taper per foot -	____	____
7. Rough turned taper to size -	____	____
8. Measured and adjusted taper attachment until desired taper is gotten -	____	____
9. Finished turn taper to specifications ± .002 TPI -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Center Drill
Tool Bit
Microcmeter

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 20

Task: Machine internal taper using taper attachment and boring bar to produce a specified amount of taper.

Achievement Indicators: The learner:

	Yes	No
1. Chucked work -	____	____
2. Selected and set speed(s) -	____	____
3. Center drilled work -	____	____
4. Faced work -	____	____
5. Drilled workpiece to maximum diameter for boring -	____	____
6. Adjusted taper attachment to desired taper per foot -	____	____
7. Selected and set speed and feed for boring -	____	____
8. Machined internal rough cuts and adjusted (if necessary) -	____	____
9. Measured and adjusted as necessary -	____	____
10. Bored to finish size -	____	____
11. Checked to plug gage -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:	**Resources:**
Lathe & Accessories Micrometer Center Drill Drill	

Duty: Operating Lathes

Duty No. J

Task No. 21

Task: Single point chase external thread using tool bit and compound rest to meet blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Chucked workpiece -	____	____
2. Selected and set speed -	____	____
3. Face and center drill work -	____	____
4. Mounted work between centers -	____	____
5. Cut clearance and/or undercut if needed -	____	____
6. Selected desired thread and set machine for threading -	____	____
7. Set compound to correct angle -	____	____
8. Mounted, aligned, and centered tool bit -	____	____
9. Selected correct thread chasing dial combination -	____	____
10. Machined threads to specification using cutting oil -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Center Drill
Threading Tool

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 22

Task: Single point chase internal threads using boring bar to meet blueprint specifications.

Achievement Indicators: The learner:	Yes	No
1. Chucked workpiece -	____	____
2. Selected and set speed -	____	____
3. Faced and center drilled workpiece -	____	____
4. Drilled workpiece bore if necessary -	____	____
5. Set compound to correct angle -	____	____
6. Mounted and aligned boring bar -	____	____
7. Selected correct thread chasing dial combination -	____	____
8. Machined threads to specifications using cutting oil -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Boring Bar
Threading Tool

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 23

Task: Rechase threads using lathe and single point tool to "pick up" incomplete thread form.

Achievement Indicators: The learner:

	Yes	No
1. Mounted and centered workpiece -	____	____
2. Set compounds to correct angle -	____	____
3. Mounted single point tool using center gage -	____	____
4. Selected and set speed and desired thread to be chased -	____	____
5. Engaged half nut lever on correct line and pick up thread by adjusting compound and cross feed -	____	____
6. Adjusted cross feed dial to zero -	____	____
7. Rechased threads to specifications -	____	____
8. Used nut or ring gage to check thread -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Threading Tool Bit

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 24

Task: Cut threads on a lathe by hand using die in diestock to attain desired size.

Achievement Indicators: The learner:

	Yes	No
1. Chucked stock -	____	____
2. Chamferred end of stock -	____	____
3. Selected and mounted die in diestock -	____	____
4. Aligned die by using face of tale stock spindle (turn chuck by hand to start die) -	____	____
5. Used cutting oil while hand taping stock -	____	____
6. Checked threads using ring gage or nut -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 25

Task: Cut threads with lathe using expanding die heads to attain desired size.

Achievement Indicators:

The learner:	Yes	No
1. Chucked stock -	____	____
2. Chamferred end of stock -	____	____
3. Mounted die head in tale stock -	____	____
4. Adjusted die to desired size -	____	____
5. Cut thread using die head and cutting oil -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 26

Task: Produce tapped hole using tap to attain desired thread size.

Achievement Indicators: The learner:

	Yes	No
1. Secured and trued workpiece in chuck -	____	____
2. Faced workpiece -	____	____
3. Center drilled work -	____	____
4. Drilled tap drill hole -	____	____
5. Chamferred hole -	____	____
6. Selected tap and tap wrench -	____	____
7. Aligned tap using tailstock -	____	____
8. Tapped hole to specifications using cutting fluid -	____	____
9. Removed burrs -	____	____
10. Inspected tapped hole -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Tool Bit
Center Drill
Drill
Tap & Tap Wrench

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 27

Task: Perform form turning operation(s) using form tool to attain required shape.

Achievement Indicators: The learner:

The learner:	Yes	No
1. Selected proper holding device for job -	____	____
2. Selected proper roughing tool -	____	____
3. Selected proper speed -	____	____
4. Rough turned shape leaving stock for finish cuts -	____	____
5. Set up form tool for finish cut (Grind tool if necessary) -	____	____
6. Selected proper speeds -	____	____
7. Used lubricant in finishing form to specific size -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Tool Bit
Form Tool

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 28

Task: Perform lathe filing using proper file to attain desired size and finish.

Achievement Indicators: The learner:

	Yes	No
1. Chucked workpiece -	____	____
2. Selected proper speed for filing -	____	____
3. Selected proper file -	____	____
4. Held file in a safe manner -	____	____
5. Filed workpiece to suit specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:
Lathe & Accessories
File
Tool Bit
Micrometer

Resources:

Duty: Operating Lathes

Duty No. J

Task No. 29

Task: Knurl parts using knurling tool to provide gripping surface.

Achievement Indicators: The learner:	Yes	No
1. Mounted workpiece between centers or chuck and center -	____	____
2. Selected and mounted proper knurling tool (coarse, medium, or fine) -	____	____
3. Selected proper feed and speed -	____	____
4. Aligned tool 90° to work axis -	____	____
5. Knurled until desired depth is reached -	____	____
6. Used lubricant while knurling -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Lathe & Accessories
Tool Bit
Knurling Tool

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal	**Duty No.** K **Task No.** 15

Task: Perform reaming operation using reamer to size hole.

Achievement Indicators: The learner:

	Yes	No
1. Mounted and aligned workpiece -	____	____
2. Located hole to be drilled and reamed -	____	____
3. Selected speed and feeds for each operation -	____	____
4. Center drilled workpiece -	____	____
5. Drilled hole 1/64 dia., over 3/4 drill size 1/32 under -	____	____
6. Reamed hole to size using cutting fluid -	____	____
7. Bored and reamed, in that order, if hole locations were critical -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 14

Task: Performed drilling using tools and equipment to produce desired holes in workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Mounted and aligned work -	____	____
2. Located first hole from reference according to print specifications -	____	____
3. Used graduations on machine or digital read out system if available to move to proper location(s) -	____	____
4. Selected proper speed -	____	____
5. Center drilled -	____	____
6. Drilled hole(s) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications and supervisor's guidance.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 13

Task: Sweep holes and pins using equipment to locate centers.

Achievement Indicators:

The learner:	Yes	No
1. Mounted drill chuck or collet to hold indicator -	____	____
2. Mounted indicator -	____	____
3. Disengaged high or low range of spindle to neutral -	____	____
4. Swept hole or pin with indicator and adjusted table until spindle is centered in X axis -	____	____
5. Swept hole or pin with indicator and adjusted table until spindle is centered in Y axis -	____	____
6. Swept in both axis; to recheck (if necessary) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according toshop supervisor's guidance.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 12

Task: Set up workpiece using wiggler edge finders and tools and equipment to locate reference corner.

Achievement Indicators:

The learner:	Yes	No
1. Mounted chuck or collet to hold edge finder -	____	____
2. Mounted edge finder -	____	____
3. Selected RPM of greater than 600 -	____	____
4. Lowered quill so top of edge finder will touch off side of workpiece -	____	____
5. Moved tip in until end of edge finder shoots tip off -	____	____
6. Added .100 more to align spindle directly over edge -	____	____
7. Repeated steps 4-6 on adjacent side -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's guidance.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 11

Task: Square up workpiece using table vise to desired squareness.

Achievement indicators: The learner:

		Yes	No
1.	Mounted and aligned vice -	_____	_____
2.	Selected and mounted cutter -	_____	_____
3.	Selected and set speed and feed -	_____	_____
4.	Mounted workpiece in vice -	_____	_____
5.	Machined first side -	_____	_____
6.	Rotated first side cut to solid jaw of vice -	_____	_____
7.	Machined second side and measured for accuracy -	_____	_____
8.	Rotated end for end and machined third side. First side still against solid jaw.	_____	_____
9.	Rotated to final side and machined side four -	_____	_____
10.	Measured for squareness and accuracy -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's guidance.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal	**Duty No.** K **Task No.** 10

Task: Identify/select cutters and tooling using references, cutters and tooling to meet specific machining requirements.

Achievement Indicators: The learner:

	Yes	No
1. Identified steel to be machined -	____	____
2. Identified cutter to perform machining -	____	____
3. Determined cutting speed and feed -	____	____
4. Selected coolant if needed -	____	____
5. Machined part -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 9

Task: Change arbors, adapters, and cutters using references and equipment to complete specific machining operations.

Achievement Indicators: The learner:

	Yes	No
1. Selected cutter for job -	____	____
2. Mounted arbor in machine -	____	____
3. Positioned cutter on arbor using backings to locate cutter -	____	____
4. Mounted over arm support and tightened arbor nut -	____	____
5. Selected proper RPM and feed for cutter -	____	____
6. Machined workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's guidance and print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 8

Task: Select work-holding devices using knowledge and equipment to secure workpiece for machining.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper height T-bolts -	____	____
2. Positioned clamp and T-slot stop -	____	____
3. Located hold down bolts next to work -	____	____
4. Leveled out clamp with step blocks -	____	____
5. Positioned workpiece against T-slot stop and tightened down -	____	____
6. Machined workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's guidance.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 7

Task: Align milling machine vise using dial test indicator to attain the desired location on the machine table.

Achievement Indicators:

The learner:	Yes	No
1. Cleaned vice and table of dirt and burrs -	____	____
2. Placed vice on table, aligned by sight -	____	____
3. Fastened vice to table using clamping bolts -	____	____
4. Mounted dial indicator in spindle or attached with magnetic holders using proper accessories -	____	____
5. Clamped parellel in vice to apply pressure to solid jaw -	____	____
6. Indicated solid or fixed jaw -	____	____
7. Secured clamp bolts -	____	____
8. Rechecked alignment -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's guidance.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 6

Task: Tram head of vertical mill using indicator, to align spindle.

Achievement Indicators:

The learner:	Yes	No
1. Tightened up knee, saddle, and table clamps -		
2. Mounted indicators in spindle (swing at least width of table)		
3. Lowered quill until indicator point made contact with table -		
4. Locked quill in position -		
5. Loosened head clamp bolts, then retightened each to create a slight drag -		
6. Swept table side to side in X axis -		
7. Adjusted head one half the difference between two readings -		
8. Swept table again and recheck reading -		
9. Tightened head clamp bolts when adjusted properly -		
10. Swept table again to make sure nothing changed in tightening bolts -		
11. Repeated 6-10 in Y axis -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor guidance.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal	**Duty No.** K **Task No.** 5

Task: Perform climb and conventional milling using knowledge of cutter pressure in relation to lead screw(s).

Achievement Indicators: The learner:

	Yes	No
1. Mounted milling cutter in machine -	____	____
2. Selected proper speed and feed -	____	____
3. Performed conventional milling operation:		
a. Selected proper direction of feed in relation to cutter rotation -	____	____
b. Prevented backlash situation -	____	____
4. Performed climb milling operation:		
a. Selected proper direction of feed in relation to cutter rotation -	____	____
b. Used only on very light finish cuts -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:	**Resources:**

Duty: Operating Milling Machines, Vertical and Horizontal	**Duty No.** K **Task No.** 4

Task: Select and set speeds and feeds using machinery handbook or reference material to mill workpiece.

Achievement Indicators:

The learner:	Yes	No
Feeds		
1. Identified material to be machined -		
2. Identified cutter to be used -		
3. Determined condition of machine to be used -		
4. Selected depth of cut -		
5. Determined cutting speed -		
Speeds		
1. Identified material to be machines -		
2. Identified cutter to be used -		
3. Determined condition of machine -		
4. Determined depth of cut -		
5. Determined appropriate feed -		
6. Set up feed -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal	**Duty No.**	K
	Task No.	3

Task: Perform maintenance using knowledge of milling machine to prevent mechanical problems.

Achievement Indicators:

The learner:	Yes	No
1. Inspected milling machine for maintenance and/or repair needs -	____	____
2. Cleaned milling machine -	____	____
3. Lubricated milling machine -	____	____
4. Performed routine preventive maintenance (as needed) -	____	____
5. Made minor repairs and adjustments (as needed) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 2

Task: Label parts using furnished drawing to identify components of horizontal mill.

Achievement Indicators:

The learner:	Yes	No
1. Located major parts of horizontal mill on furnished drawing:		
a. base -	____	____
b. knee -	____	____
c. column -	____	____
d. table -	____	____
e. saddle -	____	____
f. overarm -	____	____
g. arbor support -	____	____
h. arbor -	____	____
i. crossfeed handwheel -	____	____
j. table hand wheel -	____	____
k. vertical hand feed handle -	____	____
l. automatic feed engaging lever (table feed, cross feed, vertical feed) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 1

Task: Label parts using furnished drawing to identify components of vertical mill.

Achievement Indicators: The learner:

	Yes	No
1. Located major parts of vertical mill on furnished drawing:		
a. base -	_____	_____
b. knee -	_____	_____
c. column -	_____	_____
d. table -	_____	_____
f. saddle -	_____	_____
g. ram -	_____	_____
h. spindle -	_____	_____
i. cross feed handle -	_____	_____
j. table traverse hand wheel -	_____	_____
k. vertical traverse crank (knee)	_____	_____
l. speed selector -	_____	_____
m. feed selector -	_____	_____
n. clamps (cross feed, table traverse, knee, spindle) -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Operating Lathes	**Duty No.** J
	Task No. 33

Task: Set up grinding attachment using tool post grinder to finish grind workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Mounted tool post grinder in tool post -	____	____
2. Centered spindle to correct height between centers -	____	____
3. Ring tested grinding wheel before mounting -	____	____
4. Covered and protected way from grinding grit -	____	____
5. Dressed and trued grinding wheel -	____	____
6. Mounted workpiece -	____	____
7. Grind to specifications -	____	____
8. Check for taper (adjust if necessary) -	____	____
9. Finish grind to size -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards and print specifications.

Tools and Equipment:	**Resources:**
Lathe & Accessories	

Duty: Operating Lathes

Duty No. J

Task No. 32

Task: Support work using steady rest to permit access for machining ends of the part.

Achievement Indicators:

The learner:	Yes	No
1. Mounted work between centers or in chuck -	____	____
2. Located carriage in proper position before mounting steady rest -	____	____
3. Mounted steady rest -	____	____
4. Adjusted steady rest (three jaw bearing adjustment) -	____	____
5. Adjusted end of stock on center if held in chuck alone -	____	____
6. Lubricate three jaw bearing surface on workpiece -	____	____
7. Selected proper speed and feed -	____	____
8. Performed machining operation -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Lathe & Accessories

Resources:

Duty: Operating Lathes	**Duty No.** J **Task No.** 31

Task: Support work using follower rest to keep long slender shafts from deflecting.

Achievement Indicators: The learner:

	Yes	No
1. Mounted work between centers or chuck and centers -	____	____
2. Selected proper speed and feed -	____	____
3. Mounted follower rest to support long slender shafts -	____	____
4. Adjusted tool and tool holder to proper position -	____	____
5. Rough turned work -	____	____
6. Finish turned work -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment: Lathe & Accessories	**Resources:**

Duty: Operating Milling Machines, Vertical and Horizontal	**Duty No.** K **Task No.** 16

Task: Counterbore/countersink/spotface workpiece using tools and equipment to meet blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Mounted workpiece -	____	____
2. Located hole to be counterbored -	____	____
3. Selected proper cutting speed(s) and feed(s) for operations performed -	____	____
4. Center drilled hole -	____	____
5. Drilled hole to size of pilot on counterbore tool -	____	____
6. Counterbored to print specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 18

Task: Spotface workpiece using proper size tool and equipment to blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Mounted workpiece -	____	____
2. Located hole to be spotfaced -	____	____
3. Selected proper speed for spotface -	____	____
4. Centerdrilled hole -	____	____
5. Drilled hole -	____	____
6. Spotfaced hole so head of bolt is at right angles to axis of hole -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 19

Task: Bore hole using offset boring head to obtain a hole of desired tolerance.

Achievement Indicators: The learner:	Yes	No
1. Mounted workpiece -	____	____
2. Located hole to be bored -	____	____
3. Selected speeds and feeds -	____	____
4. Center drilled hole -	____	____
5. Drilled pilot hole -	____	____
6. Bored hole to size and exact location -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 20

Task: Perform machining operation using flycutter to square workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Mounted workpiece -	____	____
2. Mounted flycutter to square work -	____	____
3. Selected and set speed and feeds -	____	____
4. Cleaned up largest surface area on part first -	____	____
5. Removed burrs and placed against solid jaw of vice -	____	____
6. Machined side two to clean up (check for square) -	____	____
7. Rotated workpiece end for end with side one still against solid jaw -	____	____
8. Machined third side to specific size -	____	____
9. Rotated last side up to be machined to size -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications with supervisor's guidance.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 21

Task: Mill workpiece using end mill, to layout lines and/or desired dimensions.

Achievement Indicators: The learner:

	Yes	No
1. Mounted workpiece in vice -	____	____
2. Selected and mounted end mill -	____	____
3. Selected proper cutting speed and feed -	____	____
4. Milled to prescribed lines -	____	____
5. Milled to finish size -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal	**Duty No.** K **Task No.** 22

Task: Perform machining operation using form mill to obtain desired shape.

Achievement Indicators:

The learner:	Yes	No
1. Mounted and aligned work -	____	____
2. Selected and mounted form ground milling cutter -	____	____
3. Selected speed(s) and feed(s) -	____	____
4. Made roughing cut -	____	____
5. Checked shape -	____	____
6. Made finish cuts to specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 23

Task: Perform cutting off operation using slitting saw cutter to obtain desired length of workpiece.

Achievement Indicators: The learner: Yes No

1. Mounted workpiece - ____ ____
2. Selected and mounted slitting saw cutter - ____ ____
3. Selected and set speed and feed and depth of cut - ____ ____
4. Machined workpiece to specific length - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 24

Task: Perform straddle milling operation using horizontal mill to obtain desired width and depth.

Achievement Indicators:

The learner:	Yes	No
1. Mounted work in vice -	_____	_____
2. Selected, mounted, measured, and aligned cutter -	_____	_____
3. Selected and set speed and feed for straddle milling -	_____	_____
4. Made roughing cut -	_____	_____
5. Measured and made adjustments -	_____	_____
6. Machined to specifications -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 25

Task: Mill external key way using milling cutter to obtain desired size and shape.

Achievement Indicators: The learner:

		Yes	No
1.	Mounted work in vise -	____	____
2.	Selected proper cutter (under size, finish, key size) -	____	____
3.	Selected speed and feeds -	____	____
4.	Picked up side of shaft with cutter -	____	____
5.	Moved over one half the shaft size plus one half cutter size -	____	____
6.	Picked up top of shaft, feed to depth of key minus .010 -	____	____
7.	Roughed key to size and depth -	____	____
8.	Finsied to depth -	____	____
9.	Finished side of key by moving in same direction as used in going to center of shaft. This should be one half the difference between cutter size and finish size -	____	____
10.	Used adjustable parallel precision gage blocks to finish other side of key until it fit key -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:	**Resources:**

Duty:	Operating Milling Machines, Vertical and Horizontal	**Duty No.** K **Task No.** 26

Task: Mill vertical/horizontal/angular surfaces using tools and equipment to machine three different planes.

Achievement Indicators: The learner:

	Yes	No
1. Layed out desired angle on part -	____	____
2. Machined desired angles to layout lines held in vice -	____	____
3. Used pointer to pick up lines on part -	____	____
4. Selected proper speed and feeds -	____	____
5. Machined surface to layout line -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 27

Task: Mill workpiece using angle plate and sine bar to obtain desired angle.

Achievement Indicators:

The learner:	Yes	No
1. Mounted work to angle plate with C-clamps -		
2. Used sine bar and Jo Block build up for desired angle -		
3. Selected speed and feed for cutter -		
4. Machined desired angle -		
5. Measured and inspected workpiece -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 28

Task: Identify milling machine attachments using tools and equipment to machine workpiece using each attachment.

Achievement Indicators: The learner: Yes No

1. Identified attachments and their uses for the shop supervisor:
    a. dividing head attachment - ____ ____
    b. rotary table attachment - ____ ____
    c. slotting attachment - ____ ____
    d. horizontal milling attachment - ____ ____
    e. vertical milling attachments - ____ ____
    f. right angle milling attachment - ____ ____
    g. high speed milling attachment - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 29

Task: Shape internal slots using slotter and attachments to obtain desired size.

Achievement Indicators: The learner: Yes No

1. Mounted slotting attachment on machine - ____ ____
2. Selected and ground proper tool for job - ____ ____
3. Selected proper strokes per min. to cut key - ____ ____
4. Mounted work on table in V-block - ____ ____
5. Adjusted stroke to desire length - ____ ____
6. Located tool in center of hole - ____ ____
7. Machined key to size - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications under guidance of shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal	**Duty No.** K **Task No.** 30

Task: Perform indexing operation using dividing head to obtain desired number of divisions.

Achievement Indicators: The learner:

	Yes	No
1. Mounted index head on mill table -	____	____
2. Selected desired index plate -	____	____
3. Set sector arms -	____	____
4. Mounted work in chuck of dividing head -	____	____
5. Roughed out blank -	____	____
6. Finished blank to size -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 31

Task: Mill gears using dividing head to obtain desired shape.

Achievement Indicators:

The learner:	Yes	No
1. Mounted dividing head with tailstock center -		
2. Mounted workpiece on mandrel -		
✓ 3. Indicated workpiece in -		
4. Select proper index plate -		
5. Positioned sector arms -		
6. Mounted blank between centers -		
7. Centered gear blank -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 32

Task: Mill cylindrical work using rotary table to obtain desired shape.

Achievement Indicators:

The learner:	Yes	No
1. Mounted rotary table -	____	____
2. Mounted work to rotary table -	____	____
3. Indicated part in on table -	____	____
4. Machined desired shape -	____	____
5. Selected proper speed and depth of cut -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 33

Task: Mill internal and external radii using rotary table to obtain desired shape.

Achievement Indicators:

The learner:	Yes	No
1. Mounted rotary table -	____	____
2. Mounted work to rotary table -	____	____
3. Centered spindle on table -	____	____
4. Selected speed and feed -	____	____
5. Made roughing cuts -	____	____
6. Measured and readjusted or aligned if necessary -	____	____
7. Made finish cuts -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 34

Task: Align right angle milling attachment using dial test indicator to obtain desired tolerance on workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Mounted right angle milling attachment -	____	____
2. Swept spindle in, to right angle plate -	____	____
3. Adjusted head until it is within tolerance -	____	____
4. Machined right angle operation -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 35

Task: Machine workpiece using tracing attachment and pattern to produce a finished part.

Achievement Indicators:

The learner:	Yes	No
1. Mounted workpiece -	____	____
2. Mounted and aligned pattern-holding device -	____	____
3. Selected and mounted cutter and stylus -	____	____
4. Adjusted stylus position over pattern and workpiece -	____	____
5. Selected proper speed and feeds -	____	____
6. Duplicated the profile -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to print specifications.

Tools and Equipment:

Resources:

Duty: Operating Milling Machines, Vertical and Horizontal

Duty No. K

Task No. 36

Task: Inspect complete milled workpiece using precision measuring instruments to print specifications.

Achievement Indicators: The learner:	Yes	No
1. Inspected all parts for visible flaws -	____	____
2. Determined limits, tolerance, and/or an allowance for parts -	____	____
3. Inspected for material conditions and clearance -	____	____
4. Inspected finished part -	____	____
5. Passed or rejected parts -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's supervision.

Tools and Equipment:

Resources:

Duty: Operating Shapers

Duty No. L

Task No. 1

Task: Identify parts of shaper using knowledge to communicate within the technical language of the trade.

Achievement Indicators: The learner:

	Yes	No
1. Labeled correctly:		
a. ram -	____	____
b. ram positioning -	____	____
c. down feed handle -	____	____
d. clapper box -	____	____
e. stroke regulator shaft -	____	____
f. cross feed traverse handle -	____	____
g. vertical traverse handle -	____	____
h. crossrail -	____	____
i. power feed levers -	____	____
k. gear change or speed control levers -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:
Shaper and accessories

Resources:

Duty: Operating Shapers.	**Duty No.** L **Task No.** 2

Task: Perform preliminary maintenance and tests using knowledge and equipment to complete requirements for safe operation and set up of a shaper.

Achievement Indicators: The learner:	Yes	No
1. Cleaned and lubricated shaper -	____	____
2. Cleaned and inspected holding devices -	____	____
3. Checked belts for wear and adjusted if needed -	____	____
4. Inspected nuts and bolts for wear -	____	____
5. Inspected all moving parts -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to maintenance manual specifications.

Tools and Equipment:	**Resources:**
Shaper and accessories	

Duty: Operating Shapers	**Duty No.** L **Task No.** 3	

Task: Position clapper box in proper relationship using knowledge and tools to cutting edge and feed direction to maximize tool life.

Achievement Indicators: The learner:	Yes	No
1. Mounted and secured work holding device (if necessary) -	____	____
2. Aligned vise jaws (if necessary) -	____	____
3. Adjusted clapper box:		
a. adjusted properly to cutting edge -	____	____
b. adjusted properly to direction of feed -	____	____
4. Mounted workpiece -	____	____
5. Adjusted tool for clearance -	____	____
6. Adjusted proper length of stroke:		
a. forward stroke ¼" beyond workpiece -	____	____
b. return stroke ½" beyond workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:	**Resources:**
Shaper and accessories	

Duty: Operating Shapers	**Duty No.** L
	Task No. 4

Task: Select speeds and feeds using knowledge and equipment to maximize cutting efficiency.

Achievement Indicators: The learner:	Yes	No
1. Selected speeds from handbook -	____	____
2. Selected feeds from handbook -	____	____
3. Identified workpiece material -	____	____
4. Identified tool material -	____	____
5. Figured strokes per minute -	____	____
6. Selected available speed and feed on shaper -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to machinery handbook tables.

Tools and Equipment:	**Resources:**
Shaper and accessories	Machinery Handbook

Duty: Operating Shapers

Duty No. L

Task No. 5

Task: Sharpen shaper cutting tools using off-hand, single point tool sharpening techniques to meet job requirements.

Achievement Indicators: The learner:

	Yes	No
1. Selected appropriate tool for job -	____	____
2. Ground tool to desired shape (using pedestal grinder):		
a. dressed and trued grinding wheel -	____	____
b. rough ground tool to shape -	____	____
c. finish ground tool to correct shape -	____	____
3. Selected proper tool holder -	____	____
4. Mounted tool -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Tool Bit
Pedestal Grinder
Shaper and accessories

Resources:

Duty: Operating Shapers

Duty No. L

Task No. 6

Task: Select/position the length of the Ram stroke using knowledge and equipment to maximize cutting efficiency.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper length of stroke:		
a. forward stroke ¼" beyond workpiece -		
b. return stroke ½" beyond workpiece -		
2. Set machine stroke for workpiece -		
3. Adjusted position of stroke to match workpiece location -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:
Shaper and accessories

Resources:

Duty: Operating Shapers

Duty No. L

Task No. 7

Task: Shape workpiece square and parallel using tools and equipment to meet blueprint specifications.

Achievement Indicators: The learner:

		Yes	No
1.	Aligned vice on shaper table -	____	____
2.	Selected cutting tool -	____	____
3.	Mounted work in vice (machine largest surface area first) -	____	____
4.	Selected and figured speeds and feeds -	____	____
5.	Mounted cutting tool -	____	____
6.	Set clapper box -	____	____
7.	Machined side one -	____	____
8.	Placed side one against solid jaw of vice -	____	____
9.	Machined side two -	____	____
10.	Rotated workpiece end for end, machined side three with side one against solid jaw -	____	____
11.	Machined side four -	____	____
12.	Machined one end by aligning workpiece off the vice base with solid square -	____	____
13.	Machined remaining end -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:
Shaper and accessories

Resources:

Duty: Operating Shapers

Duty No. L

Task No. 8

Task: Shape an angular surface by using the tool head to meet blueprint specifications.

Achievement Indicators: The learner:	Yes	No
1. Mounted workpiece -	____	____
2. Selected cutting tool -	____	____
3. Selected feed and speed -	____	____
4. Selected proper stroke -	____	____
5. Adjusted head to proper angle -	____	____
6. Set clapper box -	____	____
7. Machined angle to print specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Shaper and accessories

Resources:

Duty: Operating Shapers

Duty No. L

Task No. 9

Task: True a vise parallel or perpendicular to the ram travel using dial indicators in order to produce work which will meet blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Positioned vise on table with hold down bolts -	____	____
2. Indicated solid jaw of vise parallel or perpendicular to ram -	____	____
3. Tested, adjusted, and tightened down vise -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Dial Test Indicator
Shaper and accessories

Resources:

Duty: Operating Shapers

Duty No. L

Task No. 10

Task: Set up workpiece using workholding accessories to produce parts within blueprint specifications.

Achievement Indicators: The learner:	Yes	No
1. Selected proper accessories (hold down bolts, clamp, step blocks, etc.) -	____	____
2. Positioned workpiece on table -	____	____
3. Aligned workpiece and clamped in position -	____	____
4. Selected and adjusted proper stroke -	____	____
5. Selected proper speed and feed -	____	____
6. Machined part to print specifications -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Shaper and accessories
Dial Test Indicator
Measuring Tools

Resources:

Duty: Operating Pedestal Grinding Machines

Duty No. M

Task No. 1

Task: Mount grinding wheel using proper tools to prepare machine for safe operation.

Achievement Indicators:

The learner:	Yes	No
1. Secured electric power to the machine -	____	____
2. Removed wheel guards -	____	____
3. Moved tool rest to accommodate new wheel -	____	____
4. Removed old wheel -	____	____
5. Cleaned wheel guards, spindle, spindle threads, and nut -	____	____
6. Tested new wheel for damage -	____	____
7. Installed paper washers or blotters -	____	____
8. Mounted and secured wheel correctly -	____	____
9. Replaced guards -	____	____
10. Reset tool rest and secured with proper wheel clearance -	____	____
11. Turned on power to machine -	____	____
12. Started grinder as final test -	____	____
13. Cleaned machine and work area -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Pedestal Grinding Machines	**Duty No.** M **Task No.** 2

Task: Adjust tool rest and guards to compensate for wheel wear using knowledge and tools to maintain a safe operating machine.

Achievement Indicators: The learner:	Yes	No
1. Secured power to the machine -	____	____
2. Loosened proper nuts or bolts of the tool rest -	____	____
3. Moved tool rest within 1/8" from the wheel face -	____	____
4. Tightened nuts or bolts while rotating wheel -	____	____
5. Insured wheel did not touch tool rest -	____	____
6. Re-activated power to machine -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:	**Resources:**

Duty: Operating Pedestal Grinding Machines

Duty No. M

Task No. 3

Task: Dress grinding wheel using a "Star" or "Stick" dresser to expose new sharp cutting edges on the abrasives within the wheel.

Achievement Indicators: The learner:

	Yes	No
1. Identified a dull or glazed wheel -	____	____
2. Selected a "Star" or "Stick" dresser -	____	____
3. Placed dresser properly on tool rest -	____	____
4. Traveled dresser across the wheel surface -	____	____
5. Removed all imperfections in wheel surface -	____	____
6. Removed all dull abrasive -	____	____
7. Replaced dresser to proper storage area -	____	____
8. Adjusted tool rest if necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Pedestal Grinding Machines

Duty No. M

Task No. 4

Task: Renew the cutting edges of a chisel and screw driver using off-hand grinding techniques to obtain original tool angles.

Achievement Indicators: The learner:

	Yes	No
1. Checked clearance between wheel and tool rest, adjusted as necessary -	____	____
2. Adjusted tool rest angle if necessary -	____	____
3. Removed "mushroomed" end of chisels or punches -	____	____
4. Renewed cutting edges of chisel -	____	____
5. Renewed blade of screwdriver -	____	____
6. Kept proper temper in tool by dipping into coolant -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to cutting edges and blades being restored to original specifications.

Tools and Equipment:

Resources:

Duty: Operating Pedestal Grinding Machines	**Duty No.** M **Task No.** 5

Task: Grind drills, high-speed stell lathe and shaper tools from blanks by obtaining proper tool angles.

Achievement Indicators: The learner: Yes No

1. Checked clearance between wheel and tool rest, adjusted as necessary - ____ ____
2. Adjusted tool rest angle if necessary - ____ ____
3. Properly held tool bit blank to grind side clearance, end clearance, and rake angles - ____ ____
4. Properly held dull to grind end clearance, included angle - ____ ____
5. Kept proper temper in tool by use of coolant - ____ ____
6. Inspected tool for proper tool geometry and reground as necessary - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to specifications of shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Pedestal Grinding Machines

Duty No. M

Task No. 6

Task: Mount polishing or buffing wheel on a pedestal grinder using proper tools to prepare machine for safe operation.

Achievement Indicators:

The learner:	Yes	No
1. Secured electrical power to the machine -	____	____
2. Removed wheel guards -	____	____
3. Moved tool rest to accommodate buffer wheel or wire wheel -	____	____
4. Removed old wheel -	____	____
5. Cleaned guards, spindle, spindle threads, nut -	____	____
6. Installed new wheel(s) -	____	____
7. Replaced guards -	____	____
8. Adjusted tool rest, if required -	____	____
9. Returned power to machine -	____	____
10. Cleaned machine and work area -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Pedestal Grinding Machines	**Duty No.** M **Task No.** 7

Task: Polish/buff parts using proper compounds to meet job specifications.

Achievement Indicators: The learner:

	Yes	No
1. Inspected machine for safe operation -	____	____
2. Adjusted machine guards as necessary -	____	____
3. Selected proper compound for work material -	____	____
4. Applied compounds to wheel -	____	____
5. Held work and rotated/traveresed work properly against wheel -	____	____
6. Achieved luster desired -	____	____
7. Cleaned and secured machine -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Pedestal Grinding Machines

Duty No. M

Task No. 8

Task: Operate/maintain belt grinder using knowledge to grind workpiece to specifications.

Achievement Indicators:

The learner:	Yes	No
1. Selected proper belt/disc as to grain size and type -	____	____
2. Mounted belt/disc -	____	____
3. Adjusted tool rests to meet job requirements -	____	____
4. Tracked belt to center of drums -	____	____
5. Set belt tension properly -	____	____
6. Adjusted belt/disc guards -	____	____
7. Ground work to size and shape -	____	____
8. Prevented "burning" of work -	____	____
9. Cleaned and secured machine -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 1

Task: Perform preliminary maintenance and tests using knowledge and tools to complete requirements for safe operation and set-up of a surface grinding machine.

Achievement Indicators:

The learner:	Yes	No
1. Checked all controls for proper position before power is energized to machine -	____	____
2. Inspected wheel for damage -	____	____
3. Checked magnetic chucks are in "off" position -	____	____
4. Cleaned magnetic chuck surfaces -	____	____
5. Checked coolant sump level -	____	____
6. Oiled spindle, ways and other lubrication points -	____	____
7. Checked guards, dressers, and accessories for clearance and position -	____	____
8. Energized power to machine -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 2

Task: Identify the major parts and accessories of a surface grinder using acquired knowledge to communicate within the technical language of the trade.

Achievement Indicators: The learner:

	Yes	No
1. Identified all major parts and controls of a horizontal spindle, reciprocating table surface grinder by proper name -	____	____
2. Identified major parts of vertical spindle reciprocating table surface guides by proper name -	____	____
3. Identified major parts of a vertical spindle rotating table surface grinder by proper name -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 3

Task: Identify/surface grinding wheels using the standard wheel marking system to select proper wheel to meet job requirements.

Achievement Indicators: The learner:

	Yes	No
1. Identified the abrasive type of various wheels by the wheel markings -	____	____
2. Identified the grain size of various wheels from the wheel markings -	____	____
3. Identified the wheel density and hardness of various wheels from the wheel markings -	____	____
4. Identified the Wheel Bond of a variety of wheels from the wheel marking -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standard wheel marking system and the standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty:	Operating Surface Grinding Machines	**Duty No.**	N
		Task No.	4

Task: Inspect and test a grinding wheel using the "Ring Test" to eliminate damaged wheels.

Achievement Indicators: The learner:	Yes	No
1. Inspected grinding wheel for visual cracks, nicks, and gouges -	____	____
2. Inspected grinding wheel bushing for damage -	____	____
3. Inspected grinding wheel for attached "blotters" -	____	____
4. Held wheel using an acceptable wooden object -	____	____
5. Struck wheel with wooden object to create "ring sound" -	____	____
6. Accepted or rejected wheel according to the tone of the "ring", correctly -	____	____

Criteria: Competence in the task will be recognized when several sound and unsound wheels have been tested according to the achievement indicators and the standards of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 5

Task: Dress wheel for the production of flat surface using a dresser to meet surface finish requirements.

Achievement Indicators: The learner: Yes No

1. Cleaned table or chuck as necessary - _____ _____
2. Selected proper relationship of the dresser angle to the wheel rotation - _____ _____
3. Secured dresser to magnetic chuck (or other acceptable holding method) - _____ _____
4. Adjusted the location of the dresser to proper relationship of the wheel center line - _____ _____
5. Used coolant if necessary - _____ _____
6. Selected proper traverse speed of the dresser across the wheel face - _____ _____
7. Selected proper amount removed per pass of the dresser - _____ _____
8. Attained proper surface on the wheel - _____ _____
9. Removed dresser and cleaned chuck properly - _____ _____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor and/or when the surface finish requirements are met per blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 6

Task: Form dress a wheel for the production of an angle or radius using proper dressing attachments to create a part feature to specifications.

Achievement Indicators:

The learner:	Yes	No
1. Cleaned table or chuck as necessary -	____	____
2. Selected proper dresser angle to which rotation relationship -	____	____
3. Secured form dresser to magnetic chuck or machine table -	____	____
4. Adjusted location of dresser to center line of wheel -	____	____
5. Adjusted proper angle or radius on the form dresser -	____	____
6. Traversed the dresser at the proper speed -	____	____
7. Attained the desired angle or radius required -	____	____
8. Attained the desired wheel surface quality -	____	____
9. Used coolant, if necessary -	____	____
10. Removed and cleaned chuck properly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor and/or tolerances met per blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 7

Task: Set feed reversing dogs for proper table travel using knowledge and tools to complete job requirements.

Achievement Indicators: The learner: Yes No

1. Secured workpiece to machine table, chuck, or other acceptable workholding device - ____ ____
2. Traversed table to end location of desired table travel - ____ ____
3. Moved and secured reversing dogs to trip at end location of desired table travel - ____ ____
4. Checked for proper travel past the wheel and corrected dog location if necessary - ____ ____
5. Repeated the above steps for setting reversing dogs for transverse travel if applicable - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 8

Task: Select proper table travel speeds and feed rates using knowledge to insure proper and safe operation to complete job requirements.

Achievement Indicators: The learner: Yes No

1. Estimated and set longitudinal table speed according to type of material, surface finish required, and wheel construction - ____ ____
2. Estimated and set transverse speed according to type of material, surface finish required, and wheel construction - ____ ____
3. Examined surface finish and properly adjusted controls for table speed and crossfeed to improve efficiency or surface finish - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the surface finish of the part being within blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 9

Task: Perform surface grinding using permanent or electromagnetic chuck to produce two surfaces flat and parallel within blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Cleaned magnetic chuck properly -		
2. Removed all burrs from work using proper tools -		
3. Determined amount of stock to be removed -		
4. Secured work properly to magnetic chuck -		
5. Selected proper speeds, feeds, and depth -		
6. "Touched off" work without destroying wheel dress -		
7. Removed rough stock from workpiece -		
8. Inspected part for parallelism and flatness -		
9. Removed all burrs from roughing operation -		
10. Dressed wheel as necessary -		
11. Replaced work on chuck -		
12. Removed remaining stock -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to workpiece being within blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines	**Duty No.** N **Task No.** 10

Task: Perform surface grinding using a precision angle plate to produce surfaces at 90° angles within blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Deburred work piece properly -	____	____
2. Cleaned magnetic chuck or machine table -	____	____
3. Clamped work to angle plate correctly -	____	____
4. Dial indicated work on angle plate -	____	____
5. Secured angle plate to grinder table or chuck -	____	____
6. Located wheel to work -	____	____
7. Produced acceptable surface finish -	____	____
8. Removed angle plate and work from machine correcly -	____	____
9. Deburred workpiece properly -	____	____
10. Inspected 90° angles for accuracy -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 11

Task: Perform surface grinding of a precision angle using a sine plate or sine chuck to meet blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Calculated height of gage block stack for the angle required on workpiece -	____	____
2. Selected and "rung" gage blocks required to achieve proper angle on workpiece -	____	____
3. Deburred work and cleaned work for mounting on sine plate -	____	____
4. Mounted work to magnetic sine chuck, sine plate, or angle plate and sine plate -	____	____
5. Mounted work and magnetic sine chuck, sine plate, or angle plate with work on guider table or chuck -	____	____
6. Ground angled surface correctly -	____	____
7. Removed set-up from grinder correctly -	____	____
8. Deburred work properly -	____	____
9. Inspected ground angle for accuracy -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 12

Task: Perform surface grinding of a part surface using a "cup wheel" to produce a right angle wall.

Achievement Indicators: The learner:	Yes	No
1. Deburred work properly -		
2. Cleaned chuck surface properly -		
3. Mounted work on chuck properly -		
4. Indicated work if necessary -		
5. Mounted "cup wheel" properly -		
6. Dressed wheel properly -		
7. "Touched off" part and set table stops and/or hand wheel dials -		
8. Ground wall surface -		
9. Removed work from grinder correctly -		
10. Deburred work properly -		
11. Inspected ground surface for accuracy -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Surface Grinding Machines	**Duty No.** N **Task No.** 13

Task: Perform surface grinding operations using grinding hold-downs or blocking techniques to insure a solid set-up of thin or irregular workpieces.

Achievement Indicators: The learner:	Yes	No
1. Deburred work properly -	____	____
2. Cleaned chuck surface properly -	____	____
3. Mounted work on chuck -	____	____
4. Secured work with "grinder hold-downs" or suitable blocks -	____	____
5. Dressed wheel properly -	____	____
6. Set table stops, trip dogs, as necessary -	____	____
7. Ground work -	____	____
8. Removed work and "hold-downs" from chuck properly -	____	____
9. Deburred work proplery -	____	____
10. Inspected workpiece(s) for accuracy -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 14

Task: Perform grinding of a narrow slot using a cut-off abrasive wheel to meet blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Deburred work properly -	____	____
2. Selected acceptable work holding device -	____	____
3. Mounted work properly on grinder -	____	____
4. Inspected and mounted abrasive cut-off wheel using proper techniques -	____	____
5. Set trip dogs, stops properly -	____	____
6. Located and ground narrow slot -	____	____
7. Removed work from grinder, correctly -	____	____
8. Deburred work properly -	____	____
9. Inspected workpiece for accuracy -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Surface Grinding Machines	**Duty No.** N **Task No.** 15

Task: Perform proper clean-up and securing of the machine to prevent corrosion of table slides upon completion of job.

Achievement Indicators: The learner:

	Yes	No
1. Turned off coolant supply to wheel -	____	____
2. Turned off power to magnetic chuck -	____	____
3. Spun wheel required length of time to remove liquid from wheel -	____	____
4. Placed all levers or controls in a neutral position -	____	____
5. Turned off power to spindle, hydraulic pumps, coolant pumps, rectifiers and dust collectors -	____	____
6. Removed all grinding dust and wheel particles from chuck, table, ways, and all other machine parts -	____	____
7. Dryed all non-painted machine surfaces and coated with rust preventitive -	____	____
8. Dryed and cleaned all machine accessories and placed in proper storage place -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the requirements of the shop supervisor.

Tools and Equipment:	**Resources:**

Duty: Operating Surface Grinding Machines

Duty No. N

Task No. 16

Task: Diagnose surface grinding problems using knowledge and equipment to meet job specifications.

Achievement Indicators: The learner:

	Yes	No
1. Examined surface ground surface for imperfections -	____	____
2. Recognized burning, chatter, "fish tails, and burnishing of work surfaces -	____	____
3. Described solutions to each surface problem -	____	____
4. Corrected problems using proper techniques -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to specifications of bluepring and shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 1

Task: Perform preliminary maintenance and tests using knowledge and tools to complete requirements for safe operation and set-up of a cylindrical grinder.

Achievement Indicators: The learner:

	Yes	No
1. Disengaged all levers and controls prior to energizing machine -	____	____
2. Checked grinding wheel for damage prior to energizing machine -	____	____
3. Checked all points of lubrication and added lubricant as necessary -	____	____
4. Checked coolant level and added proper mixture as necessary -	____	____
5. Checked all machine guards, dresses and accessories for clearance and position -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines	**Duty No.** 0
	Task No. 2

Task: Identify the major parts of a cylindrical grinder using acquired knowledge to communicate within the specialized language of the trade.

Achievement Indicators: The learner:

	Yes	No
1. Identified major parts and controls of an external cylindrical grinder by proper name -	____	____
2. Identified major parts of a universal (I.D. - O.D.) cylindrical grinder by proper name -	____	____
3. Identified major parts of an internal cylindrical grinder -	____	____
4. Identified major parts of a centerless cylindrical grinder -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 3

Task: Identify grinding wheels using the standard wheel marking system to select grinding wheels for job requirements.

Achievement Indicators: The learner:

	Yes	No
1. Identified by wheel designation the abrasive type of different grinding wheels -	____	____
2. Identified the grain size of different grinding wheels by their markings -	____	____
3. Identified the wheel density and hardness of different grinding wheels by their markings -	____	____
4. Identified the Wheel Bond of different grinding wheels by their markings -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standard wheel marking systems and standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 4

Task: Test condition of a grinding wheel using the "ring test" to eliminate unsafe or damaged wheels.

Achievement Indicators: The learner:

	Yes	No
1. Inspected grinding wheel for visual cracks, nicks, gauges -	____	____
2. Inspected grinding wheel bushing for damage -	____	____
3. Inspected grinding wheel for attached "blotters" -	____	____
4. Held wheel using an acceptable wooden object -	____	____
5. Struck wheel with a wooden object to create a "ring sound" -	____	____
6. Accepted or rejected wheel according to the tone of the sound	____	____

Criteria: Competence in the task will be recognized when several sound and unsound wheels have been tested according to the achievement indicators and the standards of the supervisor.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines	**Duty No.** 0 **Task No.** 5

Task: Balance a grinding wheel using the proper equipment to insure required surface finish specifications during grinding operations.

Achievement Indicators: The learner:	Yes	No
1. Selected proper wheel for job requirements -	____	____
2. Mounted wheel on arbor -	____	____
3. Placed arbor on balancing accessory -	____	____
4. Revolved wheel and arbor and determined location of counter balance weights -	____	____
5. Secured counter balance weights in location -	____	____
6. Revolved wheel and arbor and relocated weights -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to specifications set by shop supervisor.

Tools and Equipment:	**Resources:**

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 6

Task: Dress wheel for specific applications using a dresser to true sharpen a grinding wheel.

Achievement Indicators: The learner:

	Yes	No
1. Cleaned table as necessary -	____	____
2. Secured dressing attachment to machine table as necessary -	____	____
3. Adjusted dresser height and angle to the wheel as necessary -	____	____
4. Selected proper traverse speed to move dresser across the face of the wheel -	____	____
5. Selected proper amount removed from the wheel per pass of the dresser -	____	____
6. Used coolant if necessary -	____	____
7. Attained proper surface on wheel face -	____	____
8. Removed and stored dressing attachment properly -	____	____
9. Cleaned machine table properly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the standards of the shop supervisor and/or the surface finish requirement of the blueprint.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 7

Task: Test grind a workpiece using knowledge and tools to produce the desired taper on the workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Mounted work between centers -	_____	_____
2. Ground test piece or workpiece to clean up on each end -	_____	_____
3. Determined amount of taper existing on test or workpiece by proper measuring techniques -	_____	_____
4. Estimated amount and direction of table adjustment needed -	_____	_____
5. Adjusted table to estimated amount -	_____	_____
6. Re-ground testpiece or workpiece and repeated procedure to obtain amount of taper required -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications for taper.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 8

Task: Mount work in a four-jaw chuck using dial indicators to adjust for run-out.

Achievement Indicators: The learner:

	Yes	No
1. Mounted work in four-jaw chuck -	____	____
2. Adjusted the work using visual comparison techniques to get work within range of dial indicator -	____	____
3. Mounted dial indicator properly -	____	____
4. Determined total run-out of workpiece -	____	____
5. Corrected run-out for two jaws 180° apart -	____	____
6. Corrected run-out for remaining two jaws -	____	____
7. Repated steps necessary to have workpiece run true -	____	____
8. Checked for each jaw to be tight on workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to workpiece being concentric within blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Culindrical Grinding Machines

Duty No. 0

Task No. 9

Task: Measure workpiece using proper measurement techniques to determine the amount of grind stock.

Achievement Indicators: The learner:

	Yes	No
1. Selected acceptable masuring tools to determine size -	____	____
2. Determined amount of material to be removed by cylindrical grinding -	____	____
3. Selected acceptable measuring tools to determine straightness -	____	____
4. Determined amount of warpage -	____	____
5. Accepted or rejected the part as to its condition for grinding feasibility -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of the shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 10

Task: Selected proper length of table travel and set reversing "dogs" using knowledge and tools to insure proper table traverse during cylindrical grinding operation.

Achievement Indicators: The learner:	Yes	No
1. Mounted work in acceptable work holding device -	_____	_____
2. Traversed table by hand to approximate end locations -	_____	_____
3. Set reversing dogs to rough reversing locations -	_____	_____
4. Adjusted reversing dogs to final reversing locations -	_____	_____
5. Secured reversing dogs to machine -	_____	_____

Criteria: Competence in the task will be recgonized when the achievement indicators are performed according to standards required by shop supervisor.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines	**Duty No.** 0
	Task No. 11

Task: Select proper rotation and speed for cylindrical grinding using knowledge of cylindrical grinding to obtain proper surface finish requirements.

Achievement Indicators: The learner:	Yes	No
1. Determined work to wheel rotation relationship according to size of part and diameter of wheel -	____	____
2. Selected proper work rotation -	____	____
3. Selected speed of work rotation -	____	____
4. Took rough pass on workpiece -	____	____
5. Corrected speed of work rotation as necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to surface finish requirements on blueprint.

Tools and Equipment:	**Resources:**

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 12

Task: Select proper longitudinal feedrate using knowledge to obtain proper surface finish requirements.

Achievement Indicators: The learner:

	Yes	No
1. Mounted work to meet job requirements -		
2. Selected proper work speed and rotation -		
3. Set reversing dogs -		
4. Determined longitudinal feedrate -		
5. Trial cut workpiece -		
6. Examined surface finish -		
7. Adjusted longitudinal table travel to meet surface finish requirements -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to surface finish requirements of the blueprint.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 13

Task: Set proper "dwell time" at the end of longitudinal travel using machine control settings to meet job specifications.

Achievement Indicators: The learner:	Yes	No
1. Measured and determined "hour glass" or "Bell End" conditions -	____	____
2. Set dwell controls for delay of table travel -	____	____
3. Remeasured workpiece -	____	____
4. Readjusted dwell time as necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 14

Task: Perform outside straight cylindrical grinding using tools and equipment to produce a straight cylindrical workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper workholding set up -	____	____
2. Removed scale from center holes as necessary -	____	____
3. Lubricated centers as necessary -	____	____
4. Dressed wheel as necessary -	____	____
5. Set table travel reversing dogs, table feeds, work speeds -	____	____
6. Eliminated taper -	____	____
7. Ground work to size -	____	____
8. Cleaned entire machine -	____	____
9. Dryed all machine surfaces -	____	____
10. Placed rust preventitive on all machined surfaces -	____	____
11. Stored all accessories properly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 15

Task: Perform inside cylindrical grinding using tools and equipment to produce a straight inside cylinder.

Achievement Indicators: The learner:

	Yes	No
1. Mounted work in acceptable work holding device -	____	____
2. Dial indicated and adjusted work for "run-out" -	____	____
3. Set work rotation and speed -	____	____
4. Mounted and dressed wheel properly -	____	____
5. Set table travel and reversing dogs properly -	____	____
6. Rough ground work and removed excess stock -	____	____
7. Adjusted machine in preparation for finish grinding workpiece -	____	____
8. Inspected work for size, taper, and surface finish -	____	____
9. Cleaned all machine surfaces -	____	____
10. Used rust preventative on machined surfaces -	____	____
11. Stored machine accessories properly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 16

Task: Perform external taper grinding using an outside cylindrical grinder to grind an external taper to specifications.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper set-up techniques -	____	____
2. Swiveled spindle head to proper location if necessary -	____	____
3. Swiveled table to proper location if necessary -	____	____
4. Adjusted work speed, longitudinal travel feed rate, reversing dogs, as necessary -	____	____
5. Test ground workpiece -	____	____
6. Inspected work for proper size and taper -	____	____
7. Adjusted machine and/or ste up to correct errors in amount of taper -	____	____
8. Reinspected work for proper size and taper -	____	____
9. Cleaned all machine surfaces -	____	____
10. Stored all tools and accessories properly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Operating Machines	**Duty No.** 0 **Task No.** 17

Task: Grind a shoulder perpendicular to the axis of rotation using an outside cylindrical grinder to obtain specified length requirements.

Achievement Indicators: The learner:

	Yes	No
1. Mounted work in acceptable workholding device -	____	____
2. Dressed wheel face -	____	____
3. Dressed relief on side of wheel -	____	____
4. Ground work shoulder -	____	____
5. Inspected surface finish and length -	____	____
6. Cleaned all machine surfaces -	____	____
7. Secured machine properly -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Cylindrical Grinding Machines

Duty No. 0

Task No. 18

Task: Grind an external cylinder using a workpiece mounted on a mandrel to meet blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Pressed work on mandrel -	____	____
2. Dressed wheel -	____	____
3. Lubricated centers of mandrel -	____	____
4. Selected proper drive dog -	____	____
5. Test ground outside diameter of work -	____	____
6. Adjusted table to eliminate unwanted taper -	____	____
7. Finish ground work to size -	____	____
8. Cleaned and secured machine -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Cylindrical Grinding Machines	**Duty No.** 0 **Task No.** 19

Task: Grind a precision external cylinder using steady rest to insure elimination of work deflection.

Achievement Indicators: The learner:

	Yes	No
1. Mounted work in acceptable work holding devices -	____	____
2. Dressed wheel -	____	____
3. Adjusted steady rest to work diameter -	____	____
4. Set reversing dogs -	____	____
5. Test ground outside diameter of work -	____	____
6. Adjusted steady rest to new diameter -	____	____
7. Inspected work for size and taper -	____	____
8. Adjusted set up to correct inaccuracies -	____	____
9. Ground work to finish size -	____	____
10. Cleaned and secured machine -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Operating Tool and Cutter Grinding Machines	**Duty No.** P **Task No.** 1

Task: Sharpen cutter using proper grinding wheels to attain original angles.

Achievement Indicators: The learner:

	Yes	No
Primary Clearance:		
1. Mounted a prallel test bar and aligned centers -	____	____
2. Dressed and trued wheel to specifications -	____	____
3. Mounted cutter -	____	____
4. Aligned center of cutter to center of grinding wheel -	____	____
5. Bolted tooth rest to table and adjusted for clearance angles -	____	____
6. Determined correct length of talbe travel for tooth indexing -	____	____
7. Set machine stops accurately -	____	____
8. Maintained first tooth against tooth rest tightly -	____	____
9. Moved table back and forth to grind cutter -	____	____
10. Rotated cutter over tooth rest to grind next tooth -	____	____
11. Continued steps 8 and 9 until all teeth were ground -	____	____
12. Finish ground with a .0005 depth of cut -	____	____
Secondary Clearance:		
1. Reset cutter preparatory to grinding secondary clearance -	____	____
2. Loosened the clearance dial set screw -	____	____
3. Held cutter tooth against tooth rest -	____	____
4. Lowered wheel head obtaining clearance and setting dial -	____	____
5. Locked dial -	____	____
6. Ground secondary clearance -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Operating Tool and Cutter Grinding Machines	**Duty No.** P **Task No.** 2

Task: Set up cutter using mandrels to hold cutters during sharpening.

Achievement Indicators: The learner:	Yes	No
1. Mounted a parallel test bar and aligned centers -		
2. Dressed and trued wheel to specifications -		
3. Mounted cutter on a suitable mandrel -		
4. Placed mandrel between centers -		
5. Aligned center of cutter to center of grinding wheel -		
6. Bolted tooth rest to table and adjusted for clearance angles -		
7. Determined correct length of table travel for tooth indexing -		
8. Set machine stops accurately -		
9. Maintained first tooth against tooth rest tightly -		
10. Moved table back and forth to grind cutter -		
11. Rotated cutter over tooth rest to grind next tooth -		
12. Continued steps 9 and 10 until all teeth were ground -		
13. Finish ground with a .0005 depth of cut -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Operating Tool and Cutter Grinding Machines

Duty No. P

Task No. 3

Task: Set up cutter using collets to hold cutters during sharpening.

Achievement Indicators: The learner:	Yes	No
1. Checked table to see if it was set for zero degrees -	____	____
2. Dressed and trued wheel to specifications -	____	____
3. Mounted suitable collet into spindle of machine -	____	____
4. Aligned center of cutter to center of grinding wheel -	____	____
5. Bolted tooth rest to table and adjusted for clearance angles -	____	____
6. Determined correct length of table travel for tooth indexing -	____	____
7. Set machine stops accurately -	____	____
8. Maintained first tooth against tooth rest tightly -	____	____
9. Moved table back and forth to grind cutter -	____	____
10. Rotated cutter over tooth rest to grind next tooth -	____	____
11. Ground remaining teeth -	____	____
12. Finish ground with a .0005 depth of cut -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Tool and Cutter Grinding Machines

Duty No. P

Task No. 4

Task: Set tooth rest in proper relationship to cutter using knowledge and tools to obtain proper angles.

Achievement Indicators: The learner:

	Yes	No
1. Aligned centers -	____	____
2. Dressed and trued grinding wheels -	____	____
3. Mounted cutter -	____	____
4. Aligned center of cutter to center of grinding wheel -	____	____
5. Set up tooth rest using proper tooth rest blade -	____	____
6. Moved cutter near tooth rest -	____	____
7. Adjusted tooth rest between cutter teeth -	____	____
8. Chalked or blued top of tooth rest blade -	____	____
9. Moved cutter rotating it until tooth rested on top of tooth rest blade -	____	____
10. Moved table back and forth marking the point where tooth touched tooth rest blade -	____	____
11. Used centering gauge adjusting tooth rest so that center of marked bearing point was at center height -	____	____
12. Set tooth rest blade as close to wheel as possible without touching it -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Tool and Cutter Grinding Machines	**Duty No.** P **Task No.** 5

Task: Grind proper angles on single point tools using a cutter grinder to meet job specifications.

Achievement Indicators: The learner:

	Yes	No
1. Mounted proper grinding wheel -	____	____
2. Dressed and trued as required -	____	____
3. Secured single point tool using sine bar on angle plate or secured single point tool onto fixture -	____	____
4. Determined single point tool angles from chart:		
a. identified workpiece material -	____	____
b. identified side relief angle -	____	____
c. identified end relief angle -	____	____
d. identified side rake angle -	____	____
e. identified back rake angle -	____	____
5. Ground tool to desired angles ($\pm \frac{1}{2}^{\circ}$)		
a. Adjusted tool rest -	____	____
b. swiveled table accordingly for side relief angles -	____	____
c. adjusted table for end relief angle and ground -	____	____
d. ground side rake and back rake angles -	____	____
e. measured angles and inspected for sharpness -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Programming and Operating Numerical Control Machines

Duty No. Q

Task No. 1

Task: Identify parts of a Numerical Control (N/C) Mill, Lathe or Drilling machine using knowledge to communicate the technique language of the trade.

Achievement Indicators: The learner:

	Yes	No
1. Identified machines which were typically numerically controled -	____	____
2. Identified principle parts of N/C mills, N/C drills, and N/C turning machines -	____	____
3. Identified the principle axes for N/C mills, N/C drills and N/C turning machines -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of industry.

Tools and Equipment:

Resources:

Duty: Programming and Operating Numerical Control Machines

Duty No. Q

Task No. 2

Task: Perform preliminary maintenance of an N/C machine using machine manuals to insure proper operation of the machine.

Achievement Indicators: The learner:

	Yes	No
1. Lubricated all necessary points on the machine -	____	____
2. Checked filters and replaced as necessary -	____	____
3. Checked coolant levels if necessary -	____	____
4. Cleared control of information. -	____	____
5. Checked all levers, handles, fixtures for clearance of machine parts -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Programming and Operating Numerical Control Machines	**Duty No.** Q
	Task No. 3

Task: Plot points of coordinates using the Cartesian Coordinate System to demonstrate machine positioning systems.

Achievement Indicators: The learner:

	Yes	No
1. Placed a listing of points on the X-Y Cartesian Coordinate System -	____	____
2. Placed a listing of points on the X-Z Cartesian Coordinate System -	____	____
3. Identified incremental distances between points already plotted on the Cartesian Coordinate System -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:	**Resources:**

Duty: Programming and Operating Numerical Control Machines	**Duty No.** Q **Task No.** 4

Task: Convert blueprint dimensioned by traditional methods to N/C dimensioning using knowledge to prepare the part for N/C programming.

Achievement Indicators: The learner:

	Yes	No
1. Determined where origin would be located for programming -	____	____
2. Determined if absolute or incremental or a combination would be used to program part -	____	____
3. Calculated missing dimensions as necessary -	____	____
4. Converted all dimensions and absolute or incremental data as needed -	____	____
5. Labeled all tool locations needed on the print and calculated location of tool to obtain part dimensions -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part being programmed to standards of shop supervisor.

Tools and Equipment:	**Resources:**

Duty: Programming and Operating Numerical Control Machines

Duty No. Q

Task No. 5

Task: List various input mediums used to program N/C machines using reference materials to gain a knowledge of systems available to industry.

Achievement Indicators: The learner:	Yes	No
1. Identified punch cards, paper tape, mylar tape, magnetic tape input mediums -	____	____
2. Chose the type of input medium to suite the job requirements -	____	____
3. Identified the use of direct input devices -	____	____
4. Identified various types of tape readers used in Machine Control Units -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Programming and Operating Numerical Control Machines

Duty No. Q

Task No. 6

Task: Decipher American Standard for Coding Information Interchange (ASCII) and Electronics Industries Association Codes (EIA) using a sample piece of perforated tape to troubleshoot tape reader or punch failure.

Achievement Indicators: The learner:

	Yes	No
1. Described even and odd parity -	____	____
2. Decoded a sample piece of ASCII tape -	____	____
3. Decoded a sample piece of EIA tape -	____	____
4. Trouble shot machine tape by reading a faulty tape -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Programming and Operating Numerical Control Machines	**Duty No.** Q **Task No.** 7

Task: Write a manuscript using a prescribed N/C format to program a machine to manufacture a part.

Achievement Indicators: The learner:	Yes	No
1. Identified tool locations necessary to manufacture the part -	____	____
2. Identified tool change positions -	____	____
3. Identified position of absolute zero -	____	____
4. Placed all tool locations and codes into manuscript form to manufacture the part -	____	____
5. Made a machine tape from the manuscript -	____	____
6. Obtained a print-out from the machine tape -	____	____
7. Checked for punch errors by comparing read out against manuscript -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:	**Resources:**

Duty: Programming and Operating Numerical Control Machines

Duty No. Q

Task No. 8

Task: Edit a tape using proper tape making equipment to manufacture a part to specifications.

Achievement Indicators: The learner:

	Yes	No
1. Compared program tape print-out to original manuscript -		
2. Noted errors on tape print-out -		
3. Loaded tape into reader part of tape making equipment -		
4. Punched a new tape making changes necessary in original tape -		
5. Used splicing methods to correct a section of machine tape -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part being manufactured to meet blueprint specifications.

Tools and Equipment:

Resources:

Duty: Programming and Operating Numerical Control Machines

Duty No. 0

Task No. 9

Task: Edit a part program which has been loaded into memory using edit commands to manufacture a part to specifications.

Achievement Indicators: The learner:

	Yes	No
1. Loaded perforated tape into tape reader -	____	____
2. Ran tape and stored program in the Machine Control Unite -	____	____
3. Made necessary edit changes in the program, in the Machine Control Unit -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators aer performed according to part being manufactured to meet blueprint specifications.

Tools and Equipment:

Resources:

Duty: Programming and Operating Numerical Control Machines	**Duty No.** Q **Task No.** 10

Task: Set-up tools using a manuscript to obtain proper gage lengths to manufacturer parts.

Achievement Indicators: The learner:

	Yes	No
1. Loaded all tools necessary to manufacture the part into appropriate tool holders -	____	____
2. Determined Gage Length of each individual tool -	____	____
3. Calculated the tool length offsets for each tool -	____	____
4. Loaded tool length offsets into the part program -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part being manufactured to blueprint specifications.

Tools and Equipment:	**Resources:**

Duty: Programming and Operating Numerical Control Machines

Duty No. Q

Task No. 11

Task: Proof a program using a "Dry Running" programmed N/C machine to insure proper machine movement to produce a part to specifications.

Achievement Indicators: The learner:

	Yes	No
1. Set up work in appropriate fixture -	____	____
2. Located machine to appropriate location for "dry running" part program -	____	____
3. Removed tools from machine if necessary -	____	____
4. Set machine control unit to first line of program -	____	____
5. Set machine control feed percentage dial for desired feed rate -	____	____
6. Ran the machine through the program -	____	____
7. Noted any false machine movements -	____	____
8. Corrected program discrepencies -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to standards of shop supervisor.

Tools and Equipment:

Resources:

Duty: Programming and Operating Numerical Control Machines

Duty No. Q

Task No. 12

Task: Machine a part using a N/C machine to complete a part to blueprint specifications.

Achievement Indicators: The learner:

	Yes	No
1. Set up work in appropriate fixture -	____	____
2. Located tool in proper relationship to part -	____	____
3. Set Machine Control Unit for single block running -	____	____
4. Set Machine Control Unit to first line of program -	____	____
5. Set Machine Control feed percentage dial to desired feed rate -	____	____
6. Ran program by single block -	____	____
7. Measured part and adjusted tool offsets -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part meeting blueprint specifications.

Tools and Equipment:

Resources:

Duty: Programming and Operating Numerical Control Machines	**Duty No.** Q **Task No.** 13

Task: Locate a given diameter cutter at the start and end of an angled surface using trigonometry to establish proper cutting path.

Achievement Indicators: The learner:

	Yes	No
1. Made necessary calculations to find the location of a given diameter cutter at the start and end locations of a single angle on a part -	____	____
2. Used tool offset chart to find location of a given diameter cutter at the start and end locations of an angle on a part -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part being manufactured to blueprint specifications.

Tools and Equipment:	**Resources:**
Hand Calculator	Trigonomentry Table Machine Programming Manual

Duty: Programming and Operating Numerical Control Machines

Duty No. Q

Task No. 14

Task: Perform mathematical calculations using knowledge of circular interpolation to machine a radius to specifications.

Achievement Indicators: The learner: Yes No

1. Made necessary calculations to find the locations for a given diameter tool for the start and end locations of the tool for circular interpolation - ____ ____
2. Made necessary calculations for defining the arc to the Machine Control Unit (L, J or K values) - ____ ____
3. Inserted the proper codes for clockwise or counter clockwise circular interpolation (i.e., G02 or G03) - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to part being manufactured to blueprint specifications.

Tools and Equipment:

Resources:

Duty: Operating Electro-Discharge Machines (EDM)

Duty No. R

Task No. 1

Task: Identify major parts of an EDM machine using knowledge and training to communicate the technical language of non-traditional machining processes.

Achievement Indicators: The learner:

	Yes	No
1. Identified:		
a. zero control -		
b. tool feed -		
c. tool holder -		
d. tool (electrode) -		
e. workpiece -		
f. spark gap -		
g. overcut -		
h. dielectric fluid -		
i. fixture -		
j. base -		
k. pump -		
l. power supply circuits -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the supervisor.

Tools and Equipment:

Resources:

Duty: Operating Electro-Discharge Machines

Duty No. R

Task No. 2

Task: Perform maintenance on EDM Machine using machine manual to maximize operating machine efficiency.

Achievement Indicators: The learner:	Yes	No
1. Cleaned machine -	____	____
2. Cleaned control unit -	____	____
3. Replaced dielectric fluid as needed -	____	____
4. Inspected and replaced any frayed wires -	____	____
5. Cleaned and lubricated machine spindle -	____	____
6. Inspected and replaced leaking fluid hoses -	____	____
7. Cleaned and lubricated servo mechanism -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Electro-Discharge Machines

Duty No. R

Task No. 3

Task: Demonstrate principles of EDM using knowledge and training to complete a machined workpiece.

Achievement Indicators: The learner:	Yes	No
1. Set up equipment for electrical discharge machining -		
2. Selected proper electrode -		
3. Determined means for flow of dielectric fluid -		
4. Set power supply for machining -		
5. Controlled machining rate as required -		
6. Shut down machine and cleaned up -		

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Electro-Discharge Machines	**Duty No.** R
	Task No. 4

Task: Select proper amount of amphere and voltage using knowledge of EDM practices to machine workpiece to surface finish and tolerance requirements.

Achievement Indicators: The learner:

	Yes	No
1. Determined type of electrode being used -	____	____
2. Noted surface finish requirements on blueprint -	____	____
3. Noted the tolerances on blueprint -	____	____
4. Identified method of circulating dielectric fluid to workpiece -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Operating Electro-Discharge Machines

Duty No. R

Task No. 5

Task: Select proper method of applying dielectric fluid using knowledge of machining operation to result in the most efficient method for completing part.

Achievement Indicators: The learner:	Yes	No
1. Determined the type of electrode being used -		
2. Noted surface finish requirements on blueprint -		
3. Noted the tolerances on blueprint -		
4. Determined the amount of overcut -		
5. Selected one of the following methods for circulating dielectric fluid to the workpiece -		

a. down through the electrode
b. up through the workpiece
c. vacuum flow
d. vibration

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Electro-Discharge Machines

Duty No. R

Task No. 6

Task: Choose correct electrode relative to size and shape using knowledge of materials to machine effectively and efficiently a workpiece.

Achievement Indicators: The learner:	Yes	No
1. Selected the electrode most easily to be machined at a reasonable cost -	____	____
2. Selected the electrode made from material that would produce the most efficient removal of metal from the workpiece -	____	____
3. Selected the electrode that would resist deformation during the erosion process -	____	____
4. Selected the electrode that would exhibit the least tool wear rate -	____	____
5. Selected the electrode most compatible to the dielectric fluid being used -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Electro-Discharge Machines

Duty No. R

Task No. 7

Task: Set-up machine using knowledge of overcut, feed rate, and current requirements to produce correct size detail on workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Selected proper electrode -	_____	_____
2. Set feed rate on servo mechanism -	_____	_____
3. Set power supply requirements -	_____	_____
4. Set depth stop (if producing blind hole or slot) -	_____	_____
5. Selected metho of dielectric flow -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Electro-Discharge Machines

Duty No. R

Task No. 8

Task: Set machine up for desired metal removal rate using recommended current to obtain gap voltage for stabilizing the cut.

Achievement Indicators: The learner:

	Yes	No
1. Set current at recommended amount -	_____	_____
2. Set servo mechanism at necessary rate -	_____	_____
3. Set vibrator if determined necessary -	_____	_____
4. Determined method of using dilectric fluid effectively -	_____	_____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Electro-Discharge Machines

Duty No. R

Task No. 9

Task: Set machine controls using knowledge of amperage, frequency, capacitance, and gap voltage to obtain correct surface finish for workpiece.

Achievement Indicators: The learner:

	Yes	No
1. Set current at recommended amount -	____	____
2. Set servo mechanism at necessary rate -	____	____
3. Set vibrator if determined necessary -	____	____
4. Determined most effective method of using dielectric fluid -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:

Resources:

Duty: Operating Electro-Discharge Machines	**Duty No.** R **Task No.** 10

Task: Evaluate the machining characteristics of a given workpiece using knowledge to determine time and cost of the EDM process.

Achievement Indicators: The learner:

	Yes	No
1. Determined if conventional machine tools could be used to produce the detail -	____	____
2. Determined if EDM could be used to produce the detail -	____	____
3. Estimated the amount of time needed to complete the detail with each machine process -	____	____
4. Determined the feasibility of using EDM -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to industrial standards.

Tools and Equipment:	**Resources:**

Duty: Maintaining Machines and Tools	**Duty No.** S
	Task No. 1

Task: Clean shop facility using proper tools to insure cleanliness and safety.

Achievement Indicators: The learner:

	Yes	No
1. Turned off machines -	____	____
2. Wiped down and turned in all tools -	____	____
3. Wiped down all equipment -	____	____
4. Placed wiping cloths in proper containers -	____	____
5. Removed all chips from around each machine and put in proper containers -	____	____
6. Swept floor -	____	____
7. Applied floor dry where needed -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Maintaining Machines and Tools	**Duty No.** S **Task No.** 2

Task: Clean/maintain personal work area using proper materials to insure good working conditions.

Achievement Indicators: The learner:	Yes	No
1. Wiped down and turned in all tools -	____	____
2. Returned all metal stock to proper storage areas -	____	____
3. Cleaned work area to floor level -	____	____
4. Removed chips, shavings and liquids -	____	____
5. Placed wiping cloths in proper containers -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:	**Resources:**

Duty: Maintaining Machines and Tools

Duty No. S

Task No. 3

Task: Dispose of scrap metal and trash using proper cleaning materials to insure clean shop and safe working conditions.

Achievement Indicators: The learner:	Yes	No
1. Cleaned machines and equipment of chips and shavings -	____	____
2. Placed chips or shavings in proper containers -	____	____
3. Cleaned area of scrap metal and placed in proper storage location -	____	____
4. Cleaned area of all trash or waste and placed in proper containers -	____	____
5. Located all waste containers conveniently -	____	____
6. Emptied containers when needed -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to shop supervisor's standards.

Tools and Equipment:

Resources:

Duty: Maintaining Machines and Tools

Duty No. S

Task No. 4

Task: Inspect work area using knowledge of shop safety practices to insure safe working environment.

Achievement Indicators: The learner:

	Yes	No
1. Performed inspection using checklist worksheets provided by shop safety coordinator -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to state and federal OSHI standards.

Tools and Equipment:

Resources:

Duty: Maintaining Machines and Tools

Duty No. S

Task No. 5

Task: Perform maintenance on arbor press using manual to determine needed information.

Achievement Indicators: The learner: Yes No

1. Inspected rack and gear or hydraulic system for signs of wear - _____ _____
2. Checked bed for cracks - _____ _____
3. Checked handle for bend - _____ _____
4. Checked hydraulic lines for damage - _____ _____
5. Made recommendations for repairs if needed - _____ _____
6. Identified proper lubricants to be used - _____ _____
7. Checked all safety shields - _____ _____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to maintenance manual specifications.

Tools and Equipment:

Resources:

Duty: Maintaining Machines and Tools

Duty No. S

Task No. 6

Task: Select coolants, cutting oils, or compounds for maching operation(s) using machinist handbook tables to obtain better tool life.

Achievement Indicators: The learner:

	Yes	No
1. Determined workpiece materials -	____	____
2. Identified cutting tool materials -	____	____
3. Determined machine to be used -	____	____
4. Selected coolant, cutting fluid or compounds from handbook tables -	____	____
5. Mixed coolant if necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to recommendations in machinist handbook.

Tools and Equipment:

Resources:

Duty: Maintaining Machines and Tools

Duty No. S

Task No. 7

Task: Inspect/repair hand tools using knowledge of tools to repair defective parts.

Achievement Indicators: The learner

	Yes	No
1. Inspected hand tools to determine damaged -	____	____
2. Determined if tool was repairable -	____	____
3. Disassembled tool -	____	____
5. Reassembled tool -	____	____
6. Adjusted tool if necessary -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are peformed according to manufacturer's standards.

Tools and Equipment:

Resources:

Duty: Maintaining Machines and Tools

Duty No. 5

Task No. 8

Task: Inspect/replace/adjust machine guards using operator and maintenance manual to meet OSHA standards.

Achievement Indicators: The learner:

	Yes	No
1. Checked Operator's/Maintenance Manual to account for all guards -	____	____
2. Inspected all machine guards -	____	____
3. Determined all defective guards -	____	____
4. Locked out mahine and removed damaged guard -	____	____
5. Replaced and adjusted guards to meet OSHA standards -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to manufacturer's specifications and OSHA standards.

Tools and Equipment:

Resources:

Duty: Maintaining Machines and Tools

Duty No. 5

Task No. 9

Task: Perform preventive maintenance using appropriate supplies and equipment to maximize equipment life.

Achievement Indicators: The learner:

	Yes	No
1. Oiled all machines -	____	____
2. Filled all automatic lub systems with proper lubricant -	____	____
3. Changed filters if needed -	____	____
4. Cleaned all machine ways if needed -	____	____
5. Recorded/reported loose gibs -	____	____
6. Recorded/reported malfunctions of equipment -	____	____
7. Changed coolant if needed -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to manufacturer's specifications in maintenance manual.

Tools and Equipment:

Resources:

Duty: Maintaining Machines and Tools

Duty No. S

Task No. 10

Task: Perform machine repair using service manual and proper tools to repair machine.

Achievement Indicators: The learner:

	Yes	No
1. Disconnected power to machine -	____	____
2. Selected proper tools to disassemble machine -	____	____
3. Used repair manual to troubleshoot and locate problem -	____	____
4. Disassembled problem area -	____	____
5. Cleaned, inspected, repaired or replaced needed parts -	____	____
6. Assembled parts and tested machine -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to maintenance manual.

Tools and Equipment:

Resources:

Duty: Maintaining Machines and Tools	**Duty No.** S
	Task No. 11

Task: Level/relevel machine(s) using master precision level to maintain machine accuracy.

Achievement Indicators: The learner:

		Yes	No
1.	Referred to Maintenance Manual for sequence of installation -	____	____
2.	Moved machine into position if necessary -	____	____
3.	Requested that electrical power be connected -	____	____
4.	Connected air supply if needed -	____	____
5.	Placed leveling pads under each leveling screw -	____	____
6.	Adjusted leveling screws to level machine (shim if needed) -	____	____
7.	Checked level in all positions according to manual -	____	____
8.	Adjusted locknuts when leveled -	____	____
9.	Rechecked level in all positions (power off) -	____	____
10.	Rechecked level in all positions (power on) -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to maintenance manual.

Tools and Equipment:	**Resources:**
Wrenches; Pry Bars; Master Precision Level; Shim Stock	Maintenance Manual

Duty: Using Employability Skills

Duty No. T

Task No. 2

Task: Identify job requirements using health, physical, legal, education, and other occupational information to determine the requirements of an occupation.

Achievement Indicators: The learner: Yes No

1. Listed the significant requirements (health, physical, legal, education, etc.) of the appropriate occupation - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 3

Task: Acquire wage information using available resources to determine the approximate entry wages, general wage range, and significant fringe benefits for an occupation.

Achievement Indicators: The learner: Yes No

1. Listed the approximate entry wages, general wage range, and significant fringe benefits for the appropriate occupation - ____ ____
2. Compared these wages and fringe benefits with other selected occupations - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 4

Task: Identify significant non-wage job characteristics using available resources to determine shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment and other significant job factors.

Achievement Indicators: The learner:

Yes No

1. Listed and described the significant non-wage characteristics (e.g., shift requirements, union affiliation, apprenticeships, occupational hazards, characteristics of work environment, etc.) - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills	**Duty No.** T **Task No.** 5

Task: Explore employment opportunities using available resources to describe local, regional, and national employment opportunities for an occupation.

Achievement Indicators: The learner:

	Yes	No
1. Described the local, regional, and national employment opportunities for the appropriate occupation -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills	**Duty No.** T **Task No.** 6

Task: Analyze career ladder using available resources to describe job progression in an occupation.

Achievement Indicators: The learner:

	Yes	No
1. Described the career ladder associated with the appropriate occupational area -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills	**Duty No.** T **Task No.** 7

Task: Identify personal criteria with information about available alternatives using a decision-making situation and procedures and skills in decision-making to choose a job, further training or other alternatives.

Achievement Indicators: The learner:

	Yes	No
1. Compared personal criteria with information about a job, further training or other alternatives -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 8

Task: Prepare a resume using personal information to apply for a job.

Achievement Indicators: The learner:

	Yes	No
1. Prepared a resume -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 9

Task: Write a letter of application using personal notes to apply/inquire about a job.

Achievement Indicators: The learner: Yes No

1. Wrote a letter of application/inquiry - _____ _____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills	**Duty No.** T **Task No.** 10

Task: Complete a job application using personal notes to apply for a job.

Achievement Indicators: The learner:

	Yes	No
1. Completed a job application -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills	**Duty No.** T **Task No.** 11

Task: Demonstrate appropriate dress using a knowledge of job requirements to comply with standards of on-the-job dress and grooming.

Achievement Indicators: The learner: Yes No

1. Described and/or dressed in the attire of the appropriate occupational area, including:

	Yes	No
a. grooming -	____	____
b. required health and safety equipment -	____	____
c. uniforms -	____	____
d. other ______________________________ -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills

Duty No. T

Task No. 12

Task: Complete a job interview using communication and interpersonal skills to become employed.

Achievement Indicators: The learner:

	Yes	No
1. Described and/or demonstrated appropriate characteristics for job applicants including:		
a. attire -	____	____
b. grooming -	____	____
c. conduct during the interview -	____	____
2. Described and/or demonstrated the interview process -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills	**Duty No.** T **Task No.** 13

Task: Describe personal criteria using references to identify acceptable job offers.

Achievement Indicators: The learner:

	Yes	No
1. Listed personal criteria (financial, social, etc.) which described a job offer -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills

Duty No. T

Task No. 14

Task: Demonstrate interpersonal skills to achieve successful relationships with others.

Achievement Indicators: The learner:

	Yes	No
1. Identified probable causes for conflicts and at least one possible action to relieve the conflict -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

Duty: Using Employability Skills	**Duty No.** T **Task No.** 15

Task: Identify source of continuing education for an occupation using available resources to identify career ladder alternatives.

Achievement Indicators: The learner: Yes No

1. Described the types and sources of related continuing education for the appropriate occupation and/or advancement within the career ladder associated with the occupation - ____ ____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:	**Resources:**

Duty: Using Employability Skills

Duty No. T

Task No. 16

Task: Describe job termination procedures using a knowledge of the occupational area to leave a particular job.

Achievement Indicators: The learner:

	Yes	No
1. Described procedures and practices for terminating a job -	____	____

Criteria: Competence in the task will be recognized when the achievement indicators are performed according to the satisfaction of the supervisor.

Tools and Equipment:

Resources:

MACHINE TOOL OCCUPATIONS
TOOL LIST

1. 6" English Scales Fractions
2. 6" English Scales Decimal
3. 100MM Metric Scales
4. 12" English Scales Fractions
5. 12" English Scales Decimal
6. 200MM Metric Scales
7. Micrometer Outside
8. Micrometer Inside
9. Micrometer Depth
10. Dial Indicators
11. Dial Test Indicators
12. Combination Square Set
13. Vernier Bevel Protractor
14. Vernier Height Gage
15. Vernier Calipers
16. Surface Gage
17. Planer Gage
18. Telescoping Gages
19. Small Hole Gages
20. Radius Gage
21. Feeler Gages
22. Adjustable Parallel Gage
23. Vernier Depth Gage
24. Inside/Outside Hermaphrodite Calipers and Dividers
25. Gage Blocks (81 Pieces) Metric and English Set
26. Sine Plate
27. 5" Sine Bar
28. Percision Angle Plate
29. Taper Plug Gage (Morse)
30. Scriber
31. Center Punch
32. Prick Punch
33. Drill Gage
34. Center Gage
35. Screw Pitch Gage
36. Acme Thread Gage
37. Profilometer
38. Magnifying Glass
39. Machinist Square(s)
40. V-Blocks
41. 1-2-3 Blocks
42. Parallels
43. Angle Blocks
44. Cylindrical Square
45. Thread Wires
46. Thread Micrometer
47. Hand Hacksaws
48. Files
49. Scrapers
50. Ball Peen Hammer
51. Chisel
52. Soft Faced Hammer
53. Tapes and Wrenches
54. Dies and Stock
55. Rubbing Stones
56. Lapping Plate
57. Lapping Compounds
58. Reamers
59. Adjustable Hand Reamer
60. Helical Coil Repair Set
61. Screw Extractor
62. Tap Extractor
63. Grinding Wheel Dresser
64. Abrasive Cloth and Oil
65. Abrasive Belts
66. Abrasive Disc
67. File Cards
68. Bench Brusy
69. Oil Brush
70. Layout Dies
71. Safety Glasses
72. Face Shields
73. Hand Oilers
74. Band Blades
75. Abrasive Cut-Off Wheel
76. File Band
77. Drills, Numbers, Letters, and Fraction Sets
78. Drills Metric
79. Counter Sinks
80. Counter Bore
81. C-Clamps
82. Spot Facing Tools
83. Chamfer Tool
84. Taps
85. Foot-Power Taps
86. Machine Reamers
87. Drill Chucks
88. Sleeve and Sockets
89. Center Drills
90. Transfer Punch
91. Assortment of Lathe Dogs

92. Assortment of Lathe Tool Bits
93. Assortment of Tool Holders
94. Knurling Tool
95. Centers - Live and Dead
96. Ball Bearing Center
97. Bell Center
98. Lathe Mandrel Set
99. Boring Bar Sets
100. Expanding Die Head
101. Assortment of End Mill Cutters
102. T-Slot Cutters (Assortment)
103. Woodruff Key Set
104. Shell and Mill Cutters
105. Corner Rounding End Mills
106. Dove Tail Cutter (Assortment)
107. Fly Cutters
108. Slab Mill Cutters
109. Stagger Tooth Cutter
110. Plane Mill Cutters
111. Slitting Saw
112. Double Angle Cutter
113. Single Angle Cutter
114. Convex Mill Cutter
115. Concave-Convex Mill Cutter
116. Corner Rounding
117. Face Mill Cutter
118. Involute Gear Tooth Cutters
119. Wigglers
120. Edge Finder
121. Chair
122. Assortment of Grinding Wheels
123. Surface Grinder Hold-Downs
124. Assortment of Grinding Dogs
125. Magnetic Parallels
126. Magnetic V Block
127. Diamond Dresser
128. Assortment of Resinoid Bounded Wheels
129. Assorted Electrode Materials
130. Master Mechanic Tool Set
131. Portable 1/2", 1/4", Drill Motor
132. Portable Die Grinder
133. Key Way Broach Set
134. Coolants, Fluids, Oils
135. Garburizing Compound
136. Floor Dry
137. Heat Treat Tongs and Safety Gloves
138. First Aid Kit

MACHINE TOOL OCCUPATIONS
EQUIPMENT LIST

1. Surface Plate
2. Optical Comparator
3. Heat Treat Furnaces
4. Hardness Testers
5. Anvil
6. Bench Vises
7. Horizontal Cut-Off Saw
8. Vertical Band Saw and Accessories
    a. Band Blade Welder
    b. Contouring Attachment
    c. Ripping Fences
    d. Miter Gage
    e. Abrasive Band Attachment
    f. Work Holding Jaw
    g. Disc Cutting Attachment
    h. Assortment of Guides
9. Floor Model Drill Press Machine and Accessories
    a. Vises
    b. Strap Clamp Set
    c. Power Tapping Attachment
10. Radial Drill Press Machine and Accessories
    a. Vises
    b. Table
    c. Magnetic Chuck and Collets
11. Lathe Machine and Accessories
    a. Face Plate
    b. Four Jaw Chuck
    c. Three Jaw Chuck
    d. Collet Chucks and Collets
    e. Drill Chuck
    f. Steady Rest
    g. Follower Rest
    h. Micrometer Stops
    i. Tapper Attachment
    j. Tool Post Grinder
12. Vertical Milling Machine and Accessories
    a. Vises (Plain or Swivel)
    b. Tool Makers Vise
    c. Rotary Table
    d. Dividing Head
    e. Collet and Assorted Mill Adaptors
    f. Stub Arbor
    g. Shell End Mill Arbor
    h. Face Mill Arbor
    i. Boring Head Set
    j. Slotting Attachment and Cutting Tools
    k. High Speed Mill Attachment
    l. Strap Clamp Set
    m. Drill Chuck
13. Horizontal Milling Machine and Accessories
    a. Assorted Arbors
    b. Shell End Mill Arbor and Assorted End Mill Adaptors
    c. Face Mill Arbor
    d. Morse Tapper Adaptor
    e. Vises (Plain or Swivel)
    f. Tool Makers Vise
    g. Rotary Table
    h. Dividing Head
    i. Strap Clamps
14. Shaper Machine and Accessories
    a. Swivel Shaper Vise
    b. Hold-Downs
    c. Assorted Tool Holders
15. Pedestal Grinder Machine and Accessories
    a. Assorted Grinding Wheels
    b. Wire Wheel Assortment
    c. Buffing Wheel Assortment

16. Belt-Disc Grinder Machine and Accessories
    a. Assorted Belts and Discs

17. Surface Grinder Machine and Accessories
    a. Magnetic Chuck
    b. Magnetic Sine Chuck
    c. Radius Dresser
    d. Angle Dresser
    e. Diamond Dresser and Holder
    f. Demagnetizer

18. Cylindrical Grinder Machine and Accessories
    a. Dresser and Dresser Holder
    b. Centers
    c. Steady Rest
    d. Assorted I.D. Arbors

19. Tool and Cutter Grinder Machine and Accessories
    a. Assorted Cut Wheels
    b. Assorted Spindle Extensions
    c. Assorted Tooth Rests
    d. End Mill Air Spindle Attachment
    e. I.D. - O.D. Attachment
    f. Six Jaw Chuck
    g. Four Jaw Chuck
    h. Assorted Collets
    i. Radius Cutter Attachment

20. Numerical Control:
    a. Numerical Control Mill and Accessories
        (1) Quick Change Tooling Package
        (2) Vise
        (3) Tool Length Gage
        (4) Rotary Table
    b. Numerical Control Lathe and Accessories
        (1) Tooling Package
        (2) Three Jaw Chuck
        (3) Four Jaw Chuck
        (4) Air Chuck
        (5) Collets
        (6) Centers
        (7) Steady Rest

20. Numerical Control (continued):
    c. Inspection Machine
    d. Manuscript and Tape Punch Machines
    e. Plotter Machine

21. Electro-Discharge Machine and Accessories
    a. Tooling Package

22. Digital Readout System

23. Continuous Dial Readout (Trava-dial)

24. Honing Machine and Accessories
    a. Assorted Hones
    b. Bore Gages

25. Arbor Press

STUDENT ACHIEVEMENT RECORD

MACHINE TOOL OCCUPATIONS

STUDENT ____

INSTRUCTIONS:

Mark each student's level of competence according to the following guide:

LEVEL	**GUIDE**
1	Student has been exposed to task
2	Task accomplished with assistance
3	Task accomplished to criteria by student
4	Ability to teach or demonstrate the task to others

TASK	LEVEL	DATE
A. ORGANIZING AND COORDINATING SHOP PRACTICES		
1. Coordinate workers.		
2. Inventory supplies and materials.		
3. Determine supplies and materials needed.		
4. Inspect finished product.		
5. Supervise machine use and operation.		
6. Supervise safety.		
B. PERFORMING PERSONAL SHOP PRACTICES		
1. Develop safe work habits.		
2. Follow shop dress code.		
3. Follow conduct rules.		
4. Select tool.		
C. PERFORMING TOOL CRIB OPERATIONS		
1. Distribute and collect tools.		

TASK	LEVEL	DATE
C. PERFORMING TOOL CRIB OPERATIONS (continued)		
2. Store handtools.		
3. Store various cutters.		
4. Store precision measuring instruments.		
5. Develop responsibilities.		
6. Maintain a running inventory of expendable items.		
D. PERFORMING MEASUREMENT/LAYOUT/INSPECTION OPERATIONS		
1. Measure workpiece using fractional/decimal scale(s).		
2. Measure workpiece using micrometer.		
3. Measure workpiece using vernier/dial calipers.		
4. Inspect workpiece(s).		
5. Measure angular features on workpiece.		
6. Perform precision layout.		
7. Take measurement(s) to determine diameters.		
8. Take measurement(s) to inspect workpiece.		
9. Transfer/compare measurement(s).		
10. Measure concentricity and eccentricity.		
11. Wring gage blocks.		
12. Inspect workpiece.		
13. Measure/compare features.		
14. Measure workpiece using metric measuring instruments.		
15. Check measuring tool(s).		
E. APPLYING METALLURGICAL PROCESSES		
1. Define mechanical properties of steel.		
2. Identify steel.		
3. Determine the general hardness of a variety of metal samples.		
4. Describe common alloy elements.		
5. Harden high carbon steel.		
6. Carburize low carbon steel.		
7. Case harden carburized workpieces.		

TASK	LEVEL	DATE
E. APPLYING METALLURGICAL PROCESSES (continued)		
8. Determine proper temperature for hardening various alloys.		
9. Temper hardened workpiece(s).		
10. Anneal hardened workpiece(s).		
11. Test various alloys or test samples for hardness.		
12. Determine alloy elements of steel.		
F. INTERPRETING BLUEPRINTS		
1. Make freehand working drawing.		
2. Interpret views done in orthographic projection.		
3. Calculate dimensions needed.		
4. Interpret section views.		
5. Translate notes/symbols/abbreviations.		
6. Interpret tolerance.		
7. Process part.		
G. PERFORMING BENCH WORK		
1. Saw workpiece.		
2. Hand tap threads.		
3. Cut threads.		
4. Repair equipment.		
5. Hone workpiece surface.		
6. Lap workpiece surface.		
7. Ream hole(s).		
8. Remove helical coil.		
9. Remove damaged screw and/or other non-hardened threaded hardware.		
10. Perform cross-filing operation on workpiece.		
11. Dress and/or true pedestal grinding wheel.		
12. Polish workpiece.		
13. Grind excess metal.		

TASK	LEVEL	DATE
H. OPERATING POWER SAWS		
1. Identify parts of power saws.		
2. Perform preliminary maintenance and test.		
3. Weld a band blade.		
4. Install band guides for appropriate band width.		
5. Install band blades.		
6. Set guide post(s) for proper clearance of workpiece.		
7. Cut specified materials to length.		
8. Saw contour.		
9. Lay out irregular shapes.		
10. Set power feeds for advancing workpiece into the saw.		
11. Set up power saws.		
12. Set up stops and/or fences.		
13. Perform ban filing.		
I. OPERATING DRILL PRESSES		
1. Label major parts of the drill press.		
2. Perform drill press maintenance.		
3. Layout holes.		
4. Consider material of workpiece.		
5. Drill hole.		
6. Mount and secure work.		
7. Ream hole.		
8. Sharpen drill.		
9. Select proper tool(s).		
10. Mount tools.		
11. Select sleeve.		
12. Spot-face workpiece.		
13. Tap holes.		
14. Hand tap hole(s).		
15. Drill hole.		
16. Re-align off-center hole.		

TASK	LEVEL	DATE
J. OPERATING LATHES		
1. Label major parts of lathe.		
2. Perform maintenance.		
3. Sharpen lathe tool(s).		
4. Mount tool holder, fixtures, or attachments.		
5. Align lathe centers.		
6. Align lathe.		
7. Mount work to align workpiece in four jaw independent chuck.		
8. Mount work to hold workpiece.		
9. Select proper speeds and feeds.		
10. Face workpiece.		
11. Perform center drilling.		
12. Straight turn a workpiece.		
13. Drill holes.		
14. Ream hole(s).		
15. Countersink holes.		
16. Counterbore holes.		
17. Bore hole(s).		
18. Machine short external tapered surface.		
19. Machine external taper.		
20. Machine internal taper.		
21. Single point chase external thread.		
22. Single point chase internal thread.		
23. Rechase threads.		
24. Cut threads on a lathe by hand.		
25. Cut threads with lathe.		
26. Produce tapped hole.		
27. Perform form turning operation(s).		
28. Perform lathe filing.		
29. Knurl parts.		
30. Part workpiece.		
31. Support work to keep slender shafts from deflecting.		

TASK	LEVEL	DATE
J. OPERATING LATHES (continued)		
32. Support work to permit access for machining ends of the part.		
33. Set up grinding attachment.		
K. OPERATING MILLING MACHINES, VERTICAL AND HORIZONTAL		
1. Label parts to identify components of vertical mill.		
2. Label parts to identify components of horizontal mill.		
3. Perform maintenance.		
4. Select and set speeds and feeds.		
5. Perform climb and conventional milling.		
6. Tram head of vertical mill.		
7. Align milling machine vise.		
8. Select work-holding devices.		
9. Change arbors, adapters, and cutters.		
10. Identify/select cutters and tooling.		
11. Square up workpiece.		
12. Set up workpiece.		
13. Sweep holes and pins.		
14. Perform drilling.		
15. Perform reaming operation.		
16. Counterbore/countersink/spotface workpiece.		
17. Countersink workpiece to fit 82° flat head screw.		
18. Spotface workpiece to blueprint specifications.		
19. Bore hole.		
20. Perform machining operation to square workpiece.		
21. Mill workpiece.		
22. Perform machining operation to obtain desired shape.		
23. Perform cutting off operation.		
24. Perform straddle milling operation.		
25. Mill external key way.		
26. Mill vertical/horizontal/angular surfaces.		
27. Mill workpiece.		
28. Identify milling machine attachments.		

TASK	LEVEL	DATE
K. OPERATING MILLING MACHINES, VERTICAL AND HORIZONTAL (continued)		
29. Shape internal slots.		
30. Perform indexing operation.		
31. Mill gears.		
32. Mill cylindrical work.		
33. Mill internal and external radii.		
34. Align right angle milling attachment.		
35. Machine workpiece.		
36. Inspect complete milled workpiece.		
L. OPERATING SHAPERS		
1. Identify parts of shaper.		
2. Perform preliminary maintenance and tests.		
3. Position clapper box in proper relationship.		
4. Select speeds and feeds.		
5. Sharpen shaper cutting tools.		
6. Select/position the length of the Ram stroke.		
7. Shape workpiece square and parallel.		
8. Shape an angular surface.		
9. True a vise parallel or perpendicular to the ram travel.		
10. Set up workpiece.		
M. OPERATING PEDESTAL GRINDING MACHINES		
1. Mount grinding wheel.		
2. Adjust tool rest and guards to compensate for wheel wear.		
3. Dress grinding wheel.		
4. Renew the cutting edges of a chisel and screwdriver.		
5. Grind drills, high-speed steel lathe and shaper tools from blanks.		
6. Mount polishing or buffing wheel on a pedestal grinder.		

TASK	LEVEL	DATE
M. OPERATING PEDESTAL GRINDING MACHINES (continued)		
7. Polish/buff parts.		
8. Operate/maintain belt grinder.		
N. OPERATING SURFACE GRINDING MACHINES		
1. Perform preliminary maintenance and tests.		
2. Identify the major parts and accessories of a surface grinder.		
3. Identify/surface grinding wheels.		
4. Inspect and test a grinding wheel.		
5. Dress wheel for the production of flat surface.		
6. Form dress a wheel for the production of an angle or radius.		
7. Set feed reversing dogs for proper table travel.		
8. Select proper table travel speeds and feed rates.		
9. Perform surface grinding to produce two surfaces flat and parallel within the blueprint specifications.		
10. Perform surface grinding to produce surfaces at 90° angles within blueprint specifications.		
11. Perform surface grinding of a precision angle to meet blueprint specifications.		
12. Perform surface grinding of a part surface to produce a right angle wall.		
13. Perform surface ginding operations to insure a solid set-up of thin or irregular workpieces.		
14. Perform grinding of a narrow slot.		
15. Perform proper clean-up and securing of the machine.		
16. Diagnose surface grinding problems.		
O. OPERATING CYLINDRICAL GRINDING MACHINES		
1. Perform preliminary maintenance and tests.		
2. Identify the major parts of a cylindrical grinder.		
3. Identify grinding wheels.		

TASK	LEVEL	DATE
O. OPERATING CYLINDRICAL GRINDING MACHINES (continued)		
4. Test condition of a grinding wheel.		
5. Balance a grinding wheel.		
6. Dress wheel for specific applications.		
7. Test grind a workpiece.		
8. Mount work in a four-jaw chuck.		
9. Measure workpiece.		
10. Select proper length of table travel and set reversing "dogs".		
11. Select proper rotation and speed for cylindrical grinding.		
12. Select proper longitudinal feedrate.		
13. Set proper "dwell time" at the end of longitudinal travel.		
14. Perform outside straight cylindrical grinding.		
15. Perform inside cylindrical grinding.		
16. Perform external taper grinding.		
17. Grind a shoulder perpendicular to the axis of rotation.		
18. Grind an external cylinder.		
19. Grind a precision external cylinder.		
P. OPERATING TOOL AND CUTTER GRINDING MACHINES		
1. Sharpen cutter.		
2. Set up cutter using mandrels.		
3. Set up cutter using collets.		
4. Set tooth rest in proper relationship to cutter.		
5. Grind proper angles on single point tools.		
Q. PROGRAMMING AND OPERATING NUMERICAL CONTROL MACHINES		
1. Identify parts of a Numerical Control (N/C) Mill, Lathe or Drilling machine.		
2. Perform preliminary maintenance of a N/C machine.		
3. Plot points of coordinates.		

TASK	LEVEL	DATE
Q. PROGRAMMING AND OPERATING NUMERICAL CONTROL MACHINES (continued)		
4. Convert blueprint dimensioned by traditional methods to N/C dimensioning.		
5. List various input mediums used to program N/C machines.		
6. Decipher American Standard for Coding Information Interchange (ASCII) and Electronics Industries Association Codes (EIA).		
7. Write a manuscript.		
8. Edit a tape.		
9. Edit a part program which has been loaded into memory.		
10. Set-up tools.		
11. Proof a program.		
12. Machine a part.		
13. Locate a given diameter cutter at the start and end of an angled surface.		
14. Perform mathematical calculations.		
R. OPERATING ELECTRO-DISCHARGE MACHINES (EDM)		
1. Identify major parts of an EDM machine.		
2. Perform maintenance on EDM machine.		
3. Demonstrate principles of EDM.		
4. Select proper amount of amphere and voltage.		
5. Select proper method of applying dielectric fluid.		
6. Choose correct electrode relative to size and shape.		
7. Set-up machine.		
8. Set machine up for desired metal removal rate.		
9. Set machine controls.		
10. Evaluate the machining characteristics of a given workpiece.		

TASK	LEVEL	DATE
S. MAINTAINING MACHINES AND TOOLS		
1. Clean shop facility.		
2. Clean/maintain personal work area.		
3. Dispose of scrap metal and trash.		
4. Inspect work area.		
5. Perform maintenance on arbor press.		
6. Select coolants, cutting oils, or compounds for machining operation(s).		
7. Inspect/repair hand tools.		
8. Inspect/replace/adjust machine guards.		
9. Perform preventive maintenance.		
10. Perform machine repair.		
11. Level/relevel machine(s).		
T. USING EMPLOYABILITY SKILLS		
1. Investigate employment information.		
2. Identify job requirements.		
3. Acquire wage information.		
4. Identify significant non-wage job characteristics.		
5. Explore employment opportunities.		
6. Analyze career ladder.		
7. Identify personal criteria with information about available alternatives.		
8. Prepare a resume.		
9. Write a letter of application.		
10. Complete a job application.		
11. Demonstrate appropriate dress.		
12. Complete a job interview.		
13. Describe personal criteria.		
14. Demonstrate interpersonal skills to achieve successful relationships with others.		
15. Identify source of continuing education for an occupation.		
16. Describe job termination procedures.		

CLASS ACHIEVEMENT RECORD

NAME TASK No.																					

GLOSSARY OF VOCATIONAL TERMS

Advisory Committee. An appointed group of concerned citizens and educators representative of the occupations for which training is given in the local school, organized for the purpose of helping to plan vocational programs and offering counsel on their development and operation.

Apprenticeship. An instructional program in which the learner works directly under a qualified craft worker to learn a trade.

Career Development. A lifelong process involving a series of experiences, decisions, and interactions, which, taken cumulatively, results in the formulation of a viable self concept and provides the means through which that self concept can be implemented both vocationally and avocationally.

Career Education. The total effort of public education and the community to help all individuals become familiar with the values of a work-oriented society, to integrate such values into their personal value systems, and to implement those values into their lives in such a way that work becomes possible, meaningful, and satisfying to each individual.

Career Interest. The student's decision to pursue a job description or cluster within a vocational education program area.

Cluster of Occupations. Occupations for which a common core of instruction can prepare, as for example automotive trades which prepares for such occupations as auto mechanic, auto body repairman, automotive services, auto inspector, and brake adjuster.

Completion. That statistic which describes individuals, including early leavers who have achieved their immediate objectives in preparation for entry or progressing in an occupational field and have left the vocational education program.

Cooperative Vocational Education. An instructional plan which combines learning experiences gained through regularly scheduled supervised employment in the community and vocationally oriented in-school instruction.

Coordinator (Cooperative Education). A member of a local school staff who teaches occupational and related subject content to students preparing for employment and coordinates the efforts of all helpful agencies which can assist in a training program designed to meet the needs of learners in a cooperative vocational education program. At times the coordinator may have varying degrees of responsibility in adult vocational education.

Course. A defined segment of a program.

Course Outline. An outline of subject matter to be presented or learning experiences planned for a course.

Course of Study. A guide prepared by administrators, supervisors, and teachers of a particular school or school system as an aid to teaching a given subject or area of study. More detailed than a course outline and includes statement of methods, materials, and equipment needed.

Curriculum. A sequence of educational and skill development experiences designed to accomplish a particular purpose. The curriculum for a program of vocational/technical education is designed to prepare an individual for entry, promotion, or upgrading in a specific occupation or cluster of occupations. (See definition of Cluster of Occupations.)

Disability. An injury or illness, temporary or permanent, which prevents workers from carrying on their usual occupations. A disability retirement is retirement because of physical inability to perform the job.

Disadvantaged. Disadvantaged persons are those who have academic, socioeconomic, cultural, or other handicaps that prevent them from succeeding in a regular vocational program designed for persons without such handicaps, and who for that reason require specially-designed educational programs and related services, or both, in order for them to benefit from a vocational program.

Discharge. Dismissal of a worker from employment. The term implies discipline for unsatisfactory performance and thus is usually limited to dismissals for such reasons as insubordination, absenteeism, or inefficiency.

Discrimination. Unequal treatment of workers in hiring, employment, pay or conditions of work because of race, national origin, creed, color, sex, age, union memebership activity, or any other characteristics not related to ability or job performance. Discrimination is prohibited by Federal, State, and local laws.

Duty. A large segment of work performed by an individual. It is one of the distinct major activities involved in the work performed, and it is composed of several related tasks.

Employer. General term for any individual, corporation, or other operating group which hires workers. The term "employer" and "management" are often used interchangeably.

Evaluation. A measuring or assessing of effectiveness. An on-going process by which effectiveness and progress are determined, used to guide change and offer directions for program modification and operation.

Exploratory Experiences. Those experiences in a variety of occupations, which help the students identify job traits in relation to their abilities and characteristics, and to assist them in making realistic and appropriate occupational choices.

Follow-Up Report. Usually a composite short-term or long-term report of former students indicating their present employment status or other present commitments (education, military, homemaking). More sophisticated follow-up studies seek to assess the effectiveness of the cooperative training experience to the student's present situation. Individual follow-up information is usually maintained in a student's record file.

Follow-Up Study. A study of the occupational status and progress of former students, as a means of evaluating effectiveness of the school's program of occupational preparation, of improving such preparation, and/or of determining needs of former students for further services.

General Advisory Committee. A committee that advises an institution as to its vocational/technical education activities overall. (See also; Occupational Advisory Committee).

Guidelines. The means by which significant characteristics in the evaluation of an institution or program are identified or measured.

Handicapped. Handicapped persons are those who are mentally-retarded, hard of hearing, deaf, speech-impaired, visually-handicapped, seriously emotionally disturbed, crippled, or other health-impaired persons who, by reason of their handicapping conditions, cannot succeed in a regular vocational or consumer and homemaking education program without special educational assistance, or who require a modified vocational program.

Hazardous Occupation. An occupation designated by State of Michigan and/or federal law to be considered dangerous to the health and well-being of minors.

Individualized Instruction. That type of instruction that provides techniques through which the teacher can work directly with individual students, as opposed to group instruction.

Inservice Teacher Education. All educational, and professional activities contributing to professional competencies which a person engages in after becoming employed, such as: formal course work, work experience, internships, practicums, seminars, and independent-individualized studies.

Internship. Student performs in approved job situation. Usually paid and given credit for the work. In-school instruction usually given before the work period and seldom tied in directly with job experiences. Typically one semester or more. Internship is a term used for collegiate experiences.

Job. The duties and tasks actually performed by a specific individual.

Job Analysis. See: Occupational Analysis.

Job Description. A written statement listing the elements of a particular job or occupation. The statement may include the purpose of the job, duties, equipment used, qualifications, training requirements, physical and mental demands, and working conditions.

Job Placement. Those organized activities performed by a guidance counselor or job placement coordinator designed to assist students in locating employment.

Job Type. A group of jobs that are composed of essentially the same significant duties and tasks.

Learning Resources. All textbooks, reference materials, equipment, supplies and other items and materials needed for successful achievement of learning objectives.

Manpower. People available to perform needed labor.

Management System. A technique employed to provide an organized method of accomplishing stated mission, goals, and objectives.

Minimum Wage. The lowest rate of pay, established by law or through collective bargaining, at which covered workers may be employed. The minimum wage is usually expressed as an hourly rate.

M.O.I.S. Michigan Occupational Information System.

National Occupational Competency Exam. A written and a performance exam developed by the National Occupational Competency Testing Institute, sponsored by T&I Education, for the purpose of determining the degree of competency that one has in a specific trade and industrial occupation.

Occupational Analysis. A technique for finding out what a worker in a specific occupation does and what he needs to know to perform his job efficiently, which is then used as a means of determining the teaching content in an occupational preparatory program.

Occupational Advisory Committee. A committee advising as to a program preparing for a particular occupation or cluster of occupations.

Occupational Competence. Includes technical knowledge and skills; manipulative skills; communication skills; human relations skills; work habits; and the ability to reason, to solve problems, to think independently, and to make judgments necessary for satisfactory employment in the occupation.

Occupational Field. A group of recognized occupations having many similarities, including the following characteristics in common; the type of work performed; the basic aptitudes, and the acquired knowledge and training required; the tools, machines, instruments, and other equipment used; and the basic materials used.

Occupational Objective. An occupational goal, selected by the student, the attainment of which is the purpose for his/her vocational instruction.

On-The-Job Training. Instruction in the performance of a sequentially planned task given a student-learner by the employer during the usual working hours of the occupation. Learning experiences at the training station comprises both the application of the theory of and the technical skill aspects of the learning situation, and/or the proper character, attitude and personality development of the student-learner as general goals of the training situation at the training station.

Occupational Information. Systematically organized data used by guidance personnel and others for the purpose of helping persons make a vocational choice. Material concerns the nature of the work, duties, responsibilities, and compensations involved in the several vocations, including information about employment outlook, promotional opportunities, and entrance requirements.

Occupational Objective. A specific recognized occupational goal, selected by the student, the attainment of which is the purpose of his vocational instruction. Also called: Career Objective.

Placement Coordinator. A person who provides local leadership to plan and initiate placement services.

Placement Services or Placement Activities. A series of coordinated activities for students planning further education or seeking part-time or full-time employment either for additional education, for on-the-job training or for earning a living.

Preparatory Instruction. Instruction preparing students for full or part-time employment. Also serves to prepare students to enter and advance in an occupation. Also serves to equip workers with new or different skills demanded by technological changes.

Preparatory Program. A preparatory program provides vocational instruction designed to prepare individuals for gainful employment as semi-skilled or skilled workers or technicians or semi-professionals in recognized occupations. Preparatory programs are provided in the school laboratory/classroom.

Professional Organizations. Groups of personnel interested in and working toward the improvement, advancement, and upgrading of activities, not only in their specific field, but also of activities in related fields of endeavor such as the American Vocational Association.

Program (Vocational Education). "Vocational program" means laboratory, simulation or instruction based upon individually designed learning experiences in a vocational subject preparing the student for competencies required in a recognized occupation coded in accordance with the most recent vocational education listing of programs by the United States Department of Education.

Related Vocational Instruction. In-school courses specifically designed to improve personal and social skills, provide needed basic education (remedial), and/or develop relevant occupational skills and knowledges. The course should be regularly scheduled, should complement the learning experiences at the training station, and should be planned and developed to meet the specific needs of the individual student. The content of this course should consist of the theory of the occupational skill, the specific related information, and the general related instruction necessary to achieve personal success in the world of work.

Resources. People, money and materials available to an institution in carrying out its purposes.

School Community. The total community from which the school draws students, support, and resources.

School District. An administrative unit at the local level which exists primarily to operate public schools or to contract for public school services. Normally, taxes can be levied by such units for school purposes. These units may or may not be coterminous with county, city or town boundaries. This term is used synonymously with the term "local basic administrative unit."

Skills. The acquisition of knowledge, ability, proficiency, dexterity and technical expertness that enables one to develop a learned power of doing a thing completely.

State Plan. The document submitted by the state board for vocational education to the U. S. Office of Education describing the state's vocational education program. Includes policies followed by the state in maintaining, extending, and implementing existing programs and establishing new programs to meet the intent of the Vocational Education Acts. Prerequisite for receiving federal funds under the Acts.

Survey, Community. A fact-finding study of socioeconomic conditions and resources, community agencies, industries, business, farming, institutional practices, problems and practices of families, etc., as they exist at a given time in a given community. It is generally used by the school as a guide in revising school offerings to meet local needs.

Survey, Occupational. A form of occupational census, taken by personnel trained to determine the number of qualified employees in a designated occupation in a specified geographic or economic area; and to evaluate the need for increasing or limiting the numbers available for employment in the occupations surveyed.

Task. A unit of worker activity that is intermediate in specificity between a function and a procedural work step or action. It is a discrete unit of work performed by an individual; that is, the unit usually has a definite beginning and ending, and it is performed within a limited period of time.

Task Analysis. A detailed listing of skills necessary to perform a clearly defined, specific job, organized into a logical sequence and which may be used for teaching employment, or classification purposes.

Task Inventory. An instrument used for conducting an occupational survey. It consists of items of identification and background information and a list of appropriate duty and task statements.

Teacher-Coordinator (Cooperative Vocational Education). A member of the local school staff who teaches technical and related subject matter to students preparing for employment and coordinates classroom instruction (related classroom) with learning activities at the training station. The coordinator is also responsible for the evaluation procedures of the program.

Trade and Industrial. Instruction planned to develop basic manipulative skills, safety practices, judgments, technical knowledge, and related occupational information for the purpose of preparing persons for initial employment in the trades and industrial occupations.

Training Agreement. A statement of fundamental agreements regarding the participation of a student in a work environment. Initiated by the school, the agreement reflects a voluntary and cooperative commitment on the part of the coordinator, employer, student, and parents/guardians.

Training Plan. A format for delineating, for each student, the learning experiences and tasks to be undertaken at the training station, often paralleled with classroom units of instruction. The training plan, cooperatively determined, usually becomes a part of the training agreement.

Training Station. The establishment providing learning experience for the student-learner.

VICA. Vocational Industrial Clubs of America. The youth organization for students at secondary and post-secondary levels who are in preparation for employment in trade & industrial occupations.

Vocational Education. Organized educational programs, services, and activities which are directly related to the preparation of individuals for paid or unpaid employment, or for additional preparation for a career requiring other than a baccalaureate or advanced degree.

Vocational Student Organizations. Organizations for student-learners that complement the vocational education program. Recognized student-learner organizations for vocational education are: DECA, Distributive Education Clubs of America; FFA, Future Farmers of America; FHA-HERO, Future Homemakers of America-Home Economics Related Occupations; HOSA, Health Occupations Students of America; OEA, Office Education Association at the post-secondary level in Michigan and BOEC, Business Office Education Clubs at the secondary level; VICA, Vocational Industrial Clubs of America. Organizations for students enrolled in vocational education programs, with national, state and local units, the activities of which are an integral part of the instructional program.

Work Experience and Career Exploration (WECEP). Program emphasizes learning experiences at the training station based on individual needs and provides learning experiences for those students whose needs cannot be served by regular cooperative education programs.

Work Experience Program. Students perform tasks of the actual job and may or may not be paid. Typically engaged in for general education values, including exploratory. Usually one semester or less. Limited school supervision; usually no related class.

Work Observation Program. Student observes work, does not perform tasks except to understand them. Unpaid. Plan is usually few weeks in length and may be tied in with a class in which occupational information is discussed.

Work-Study Program. A federal program designed to provide a vocational education student with employment in the public sector and supplemental income while attending school. The vocational program does not necessarily have to be related to the job.

RESOURCE LIST

Bibliography

Biekert, Russ and Lyle Zeigler. *Specialized Production Processes*. Engineering Technology, Inc., 1977.

Ford Motor Company. *Machine Operation Training Guide: Learning Guides and Reference Material for Shaper, Lathe, Mill, Grinder*. Training Services

Kibe, Richard, et al. *Machine Tool Practices*. Second Ed., John Wiley and Son, 1981.

Krar, S.F. and J.W. Oswald and J.E. St. Amand. *Technology of Machine Tools*. Second Ed., McGraw-Hill, 1977.

Oberg, Erik and Holbrook L. Horton. *Machinery's Handbook*. 21 Ed., Industrial Press, Inc., 1980.

Repp, Victor and Willard McCarthy. *Machine Tool Technology*. 4th Edition, McKnight Publishing, Bloomington, Illinois, 1979.

Wolfe, John and Everett Phelps. *Mechanics Best Pocket Reference*. #24, Prentice-Hall, Inc.

Audio-Visual Aids

Howard and Smith, Inc. *Metal Files*. 8mm filmstrip. Troy, Michigan.

Krar, S.F., et al. Machine Shop Transparencies. McGraw-Hill, 1977.

Michigan Department of Labor, Safety Education and Training Division, Bureau of Safety and Regulations, Film Librarian. *Safety Films.* Lansing, Michigan.

Norton Training Films. 16 mm. Worchester, Massachusetts:

1. *The Cutting Edge*.
2. *The Touch of Diamonds*.
3. *How to Select the Right Grinding Wheel*.
4. *The Grinding Wheel*.

Reference Materials

American Technical Society. Chicago, Illinois. Textbook Catalog.

Cincinnati MiLacron. Training Department, Machine Tool Sales Division, Cincinnati, Ohio. List of Audio-Visual Programs.

National Tool, Die and Precision Machining Association. Washington, D.C. Catalog of Texts, Instructor's Training Aids and Audio-Visuals.

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